METAL INDUSTRY

24 JANUARY 1958

Tin Prospects

IN spite of the drastic decisions of the International Tin Council at their December meeting, the market sagged below the £730 level for three months Standard tin before the turn of the year. This was due, say A. Strauss and Company Limited in the January review of the market, to the unusually large tonnage sold daily in Singapore coupled with a doubt whether the stringent measures of restriction agreed to by the Council would, by their severity, prove inoperable and lead to a breakdown of the whole scheme. The heavy sales were due to the fact that Malayan mines were granted an extension until January 1st, in which to repay the government for contributions made to the Buffer stock. Since that date Singapore sales have been small, averaging less than 150 tons a day against the normal 250 tons. And although the consequences of curtailing production are now showing themselves in the dismissal of large numbers of miners in Malaya and elsewhere, there is every indication that producing countries are determined to see the scheme through to success.

At the beginning of each year, Messrs. Strauss, in their review, try to draw up a tentative table of probable production and consumption during the ensuing twelve months in order to arrive at a rough estimate surplus or deficit that will develop during that period. Such estimates, difficult even in normal times, are found to be impossible under present conditions. The present restriction quota of 28½ per cent has been fixed for three months. Instead, therefore, of trying to make estimates around so many unknown factors, the company has merely set down figures showing what will happen on certain assumptions without expressing any view whether the severe decline in world trade on which these assumptions are based will in fact materialize.

It is known, that if the restriction quota remains at the present level throughout the year, the amount of metal available from all sources may be estimated at 131,000 tons. The review then goes on to say that it is when the consumption side of the picture is dealt with the real difficulty arises. After detailing the factor of the American tinplate industry, which absorbs 60 per cent of the total metal consumption, it is considered that tinplate production over the year is unlikely to fall by more than 10 per cent and it is also considered reasonable to assume that the world industrial recession will not be so severe as to cause a drop of more than 30 per cent. On this basis then, production and consumption will be in almost exact balance at around the 130,000 figure. Whatever the long term prospects of tin may be, it looks as if a considerable market movement may develop during the next few months. This arises from the fact that consumers, particularly in America, must have run down their stocks of metal out of all proportion to any drop in consumption. What is likely to happen to tin supplies from Indonesia as a result of the upheaval there still remains obscure. This uncertainty is likely to last for some time, but the general situation is not likely to be altered to any great extent.

Out of the MELTING POT

Possibilities

A SHORT while ago there appeared on the metal coating scene a process, or possibly several variants of a process, of coating metal parts with synthetic resins. Essentially, the process involves the use of a bed of synthetic resin in a fluidized state, i.e. a layer of the powdered resin agitated by and in suspension in an air stream rising through the powder which is contained in a suitable vessel open at the top. The metal part to be coated is preheated and then suspended in the bed of fluidized resin powder, the particles of the resin coming into contact with the surface of the preheated part, fusing and building up a pore-free coating. The interest and usefulness of this new method of coating should not be allowed to obscure the prospects of the extensions and developments to which its basic principle could be adapted by some, unfortunately non-existent, generalizing agency or body which, some time ago already, would have examined the method and would thereupon quickly have put forward at least the following suggestions:—The principle appears to be capable of being applied to the formation of metal coatings on metals, at any rate where the melting point of the coating metal is appreciably lower than that of the basis metal, e.g. tin or zinc coating of steel, though the possibility of forming sintered or otherwise bonded, as distinct from fused, coatings should not be overlooked. The use of a reducing atmosphere to fluidize the metal powder, and continuous operation of the coating process, e.g. when coating strip or wire, are self-evident developments in this connection. With the admixture of sand to the fluidized synthetic resin of the original coating process, there arises the possibility of using it as a convenient way of making shell moulds. On a much more hypothetical, though potentially very interesting and important level, a bed of fluidized metal powder could be considered as a source of material from which parts could be formed by building up, "condensation" or "crystallization," starting from a suitable nucleus or "seed," such processes again being operated in a continuous or discontinuous manner. In conclusion, there remains to envisage the possibility that even in the absence of a generalizing agency, the above and other variants of the process have been, or are being, considered and, perhaps, tried, and to wish those concerned every success.

Too Much ?

THE principle that nature abhors a vacuum, though still valid, should not be restricted to the physical vacuum in connection with which it was originally enunciated. A new idea can thus be thought of —with due respect all round—as going to fill a previously vacuous space in the mind in which it originates and in the minds of those to which it is subsequently communicated. In so far as such spaces are thereby filled, the process may be considered as beneficial or, at any rate, harmless. Unfortunately, it is somewhere at about this stage that the physical analogy of vacuum filling—like other physical analogies of mental activities and phenomena at other stages—breaks down and cannot usefully be pursued further. One of the reasons for the breakdown is that the relation between the ideas and the centres receiving them is not as simple and direct as that between a physical substance and the vacuum it goes to fill. For one thing, the pushing out of ideas, even into what looks like a very high vacuum, may fail to effect any abatement of the vacuum owing to the failure of the ideas to penetrate. At the same time, ways and means of, in particular, distributing ideas are such that it is quite possible for them to continue to function irrespective of what happens at the receiving end, or of the repercussions such as, for example, frustration which occur at the input end. Then again, the filling of a mental vacuum, unlike the filling of its physical counterpart, is not an end in itself. It should preferably start a train of thought or action at the receiving end. In this connection, there is a good deal of evidence that an oversupply of ideas can interfere with the desirable consequences of the receipt of a more limited number. Nowadays signs of overfeeding are not lacking. Little is known about the way in which the law of supply and demand operates in this field or whether, in fact, it exists at all. Possibilities of introducing it, if required, and of achieving some sort of balance remain to be studied. At present, it must be admitted, the process has every appearance of a chain reaction, the possibility of controlling or balancing which must remain illusory, at least for the time being.

Wish Fulfilment

THINKING on broad general lines about industrial and other processes and operations seems to have gone out with specialization. It has taken a very nearly brand new science, or whatever you like to call it, namely that of automation, to achieve a general look at things; but even automation has taken things as it has found them. Taking a metal cutting machine tool, for example, automation has provided a computer, control means, and a programme, and has then set the machine tool, with possibly only a few modifications, cutting out the most elaborately shaped parts with consummate ease and precision, and in a fraction of the time that would have been required by the earlier conventional step-by-step procedure. So much for general thinking. If the latter finds it difficult to get a look in, its fate is still relatively kind compared with that of wishful thinking. Severely frowned upon even in connection with harmless unimportant constituents of ordinary day-to-day existence, it is substantially banned from the scientific and technical fields. Sighing for the moon, for example, plays no part in development work on space rockets, at least not officially. Yet, given a chance, wishful thinking applied to some particular, even specialized, set-up or situation, can very often provide a first step towards some more practical thinking on general lines which, in turn, can carry matters to a stage at which the specialists can take over and do their best. Turning back, for instance, to the automated machine tool cutting fancy shapes in metal, wishful thinking, if given half a chance, should not take long to start sighing for the converse—a device which, under corresponding electronic control, would put on instead of cut off metal, to form the same fancy shape. Thinking generally from this point, one could then readily realize that methods of putting on metal (flame spraying, arc depositing, electroplating, etc.—if an etc. is justified, that is) are miles and years behind methods of removing metal to form practically any required shape to tolerances of minute fractions of an inch. How much further would it be necessary to go before the general idea was narrowed down sufficiently for the specialists to be able to grasp it ?

Skimmer

RECENT DEVELOPMENTS IN METALS FOR JET AIRCRAFT

Vacuum Melted High-Temperature Alloys

VACUUM melting is one of the newest examples of improved processing techniques which have played a prominent role in attaining higher operating temperatures in jet engines. Some developments in this field were recently described by F. M. Richmond, of the Universal-Cyclops Steel Corporation, before the Society of Automotive Engineers Inc.

One of the most critical applications of high-temperature alloys in jet engines is the turbine bucket, which must withstand severe combinations of temperature and stress. Much development work has, of course, been directed towards improving the properties of materials used for buckets. Fig. 1 is a chronological plot of the temperature ratings of bucket alloys that have been used in aircraft turbines since the advent of the turbo-supercharger in 1918. The levelling-off of this curve around 1950 was due primarily to the ceiling on hardening additions to nickel- and cobalt-base alloys imposed by the ductility requirements of jet engine turbine buckets. At that time, Howard Scott pointed out that "the strength or temperature rating of present conventional alloys may be improved by an increase in their hardener content if the ductility can be increased by some expedient," and suggested that future research be devoted primarily to discovering new methods for increasing ductility as a prerequisite to raising the strength or temperature rating. In addition to the ductility problem, development of better wrought alloys was seriously limited by forging problems.

In 1950, forged bucket alloys in use in America included nickel-base alloys such as Waspaloy (developed by Pratt and Whitney) and M-252 (developed by General Electric). These alloys are hardened primarily by additions of titanium and aluminium, which promote beneficial precipitation hardening effects. The highly reactive nature of such alloying additions, however, required the utmost skill in producing alloys of this type by conventional melting techniques, and even then the quality of the material was often less than desired. Thus, the melting problem was another serious obstacle to increased strength and ductility of bucket alloys and was, in fact, probably the most important since it was believed that improved melting techniques might be a potent remedy for all three problems—low ductility, poor forgeability and quality—which were restricting alloy development.

In the early 1950s, several commercial vacuum induction melting facilities were installed in the United States in an effort to eliminate, or at least reduce, many of the difficulties associated with melting these alloys. More recently, vacuum arc melting facilities (utilizing the consumable electrode technique) have been installed to increase the available tonnage of vacuum melted alloys and to aid in controlling the structure of large size ingots.

In reviewing the brief history and current status of commercial vacuum melting, it is fairly obvious that the melting problems associated with nickel-base alloys containing titanium and aluminium have been nearly eliminated. In addition, the improved properties achieved by vacuum melting have resulted in higher service temperatures for existing alloys, and the higher ductility, together with increased forgeability imparted by these melting techniques, have opened the door to new developments which show promise of significantly extending the temperature ratings of wrought nickel- or cobalt-base alloys.

Sources of Contamination

The primary role of vacuum melting techniques is to lower the total gas content and to reduce sources of contamination. In the electric arc furnace previously used for melting these alloys, there were three obvious sources of contamination—the crucible, the covering slag, and the air. Vacuum induction melting eliminates the slag and the air as sources of contamination, but the problem of crucible contamination has not been solved by this technique. In this type of melting, deoxidation is usually carried out by carbon or hydrogen, which produces gaseous deoxidation products that can be drawn off through the pumping system. The vacuum cold crucible arc furnace eliminates the last of the serious contaminating sources by utilizing a water-cooled copper crucible. It is important to remember, however, that crucible contamination has not been entirely eliminated in vacuum arc melting, as normally practised for iron-, cobalt- and nickel-base alloys, since the electrodes are originally consolidated by melting in furnaces utilizing ceramic crucible materials. This electrode can then be prepared by melting in conventional electric arc furnaces, the whole process thus involving a double melting operation. Alternatively, the electrode can be prepared by melting in a vacuum induction furnace. Although a complete evaluation of the effect of double melting techniques on the properties of nickel-base super alloys has not been completed, it appears that this method of melting, together with minor compositional

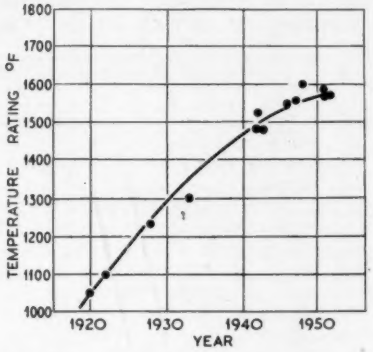


Fig. 1—Increase in temperature ratings of bucket alloys during the past 30 years

changes developed as a result of induction vacuum melting, should be nearly equivalent to the single melted material.

The means by which vacuum melting increases elevated temperature strength has not yet been discovered. It is probable that the lower gas contents (up to 90 per cent reduction as compared to air melt), together with fewer oxide and nitride inclusions, play an important part in the mechanism of high-temperature strengthening, and particularly in increasing the high-temperature ductility of these alloys. In addition to these effects, which are common to both vacuum induction and vacuum arc melting, the vacuum arc furnace has another advantage in that the highly directional solidification—bottom to top—results in a greatly improved ingot structure.

Alloy Modifications

It is important to note that all the improvement in the high-temperature properties of vacuum melted nickel-base super alloys is not due to the melting process itself but also to several minor but highly significant chemistry modifications of these vacuum melted alloys. The elimination of manganese and silicon from the nominal composition of these materials has certainly contributed to the overall improvement in high-temperature properties, particularly ductility. The melting of these alloys without manganese and silicon was, however, facilitated by the utilization of vacuum melting methods. Another significant modification, which contributed to the increase in high-temperature strength of some of these alloys, was the increase in total titanium plus aluminium content made possible by the increase in ductility at a given hardener level. Thus, vacuum melting has become the "expedient"

TABLE I—CHEMICAL COMPOSITIONS

Grade	Heat No.	C	Cr	Ni	Mo	Co	Al	Ti	Fe	W	B	Zr
J-1570	KA-173X	0·14	19·86	29·58	—	36·60	—	4·38	1·65	7·18	0·0018	(0·04)
GMR-235	KA-215X	0·093	15·51	63·85	5·42	—	2·86	2·11	10·59	—	0·10	—
Udimet 500	KA-277X	0·055	16·18	54·30	4·12	17·96	2·84	3·24	1·50	—	0·0025	0·096
M-252	KA-195	0·110	18·98	56·95	9·55	9·99	1·05	2·52	0·52	—	(0·005)	0·048
Waspaloy	KA-175	0·065	20·04	55·85	4·10	14·12	1·26	3·22	0·69	—	0·0062	—

Figures in parentheses are nominal aims; all others are actual analyses

which Scott pointed out was required to obtain increases in strength or temperature rating of high-temperature alloys.

Still another very important modification in composition has recently been made as a result of an intense investigation to determine the cause of variation in properties of vacuum melted alloys. In the early days of vacuum melting, it appeared that the vacuum melting technique was incapable of reproducing consistent properties. It now appears that a large portion of the scatter in early vacuum melted heats can be accounted for, and although the cause is related to melting practice, it is actually due to a difference in composition not noted in casual chemical analyses of the heats in question.

Last year Universal Cyclops research laboratory published a report which pointed out that very small residuals of boron (0·005-0·01 per cent) and zirconium (0·05-0·1 per cent) exhibited a tremendous beneficial effect on rupture life and ductility of various super alloys, and that this effect, or at least the level of the elements necessary to produce it, is greatly emphasized in vacuum melting. It was discovered, moreover, that these elements could be introduced accidentally by various sources of contamination, and thus account for a large portion of the scatter in vacuum melted heats. Zirconium, for instance, could be introduced into a heat melted in a zirconia crucible, and it was supposed that boron found its way into these heats by its presence in small amounts in the raw materials. It has now been discovered at the University of Michigan that boron contents of 0·002 per cent may be introduced into vacuum induction melted heats by contamination from magnesia crucibles, and that even this level of boron can greatly increase the rupture life and ductility of vacuum melted Udimet 500 (a nickel-base super alloy developed by the Utica Drop Forge and Tool Corp.). Both the Universal-Cyclops and the University of Michigan investigations point out a potent interaction between boron and zirconium which, if utilized correctly, can quadruple the rupture life and ductility of vacuum melted nickel-base super alloys at elevated temperature.

Since these modifications are being utilized simultaneously with the vacuum melting techniques, it is rather difficult to determine the exact contribution of the melting process itself as well as the individual contributions of the modifications in composition.

Alloy development programmes have, of course, continued during the past few years, and several new alloys have been developed which show great promise. One of these, GMR-235, is a cast nickel-base alloy containing, in addition to the normal hardeners, titanium, aluminium and molybdenum, from 0·025 - 0·10 per cent boron. While not originally developed as a vacuum melted alloy, it has now recently been shown that vacuum melting significantly increases the rupture life and ductility of this alloy. Two other new alloys are evidences of the new field of alloy development opened up by the increase in ductility associated with vacuum melting techniques. One of these, Udimet 500, utilizes 3 per cent titanium and 3 per cent aluminium to attain superior high-temperature properties. The other, J-1570, is a vacuum melted alloy developed by General Electric and contains about 4 per cent titanium and 7 per cent tungsten.

Mechanical Properties

Since the installation of a 1,000 lb. vacuum induction melting facility at Universal-Cyclops Steel Corporation, many heats of various nickel-base super alloys have been melted and evaluated. Most of this evaluation has been by stress rupture and tensile tests at temperatures and stress levels dictated by the pertinent specifications covering these materials. It was considered highly desirable, however, to determine the rupture and tensile properties of some of these alloys over

TABLE II—HEAT-TREATMENTS USED FOR THE VARIOUS ALLOYS

Grade	Heat-Treatment		Approximate Hardness Rc
	Solution Treatment	Ageing Treatment	
J-1570	4 hr/2150°F, A.C.	24 hr/1650°F, A.C.	32·0
GMR-235	15 min/2090°F, W.Q.	30 min/1600°F, A.C.	35·0
Udimet 500	2 hr/2150°F, W.Q.	16 hr/1550°F, A.C.	38·5
M-252	4 hr/1950°F, A.C.	15 hr/1400°F, A.C.	33·0
Waspaloy	4 hr/1975°F, A.C.	24 hr/1550°F, A.C. +16 hr/1400°F, A.C.	36·0

TABLE III—ELEVATED TEMPERATURE TENSILE DATA

Alloy	Test Temperature (°F.)	0·2 per cent Yield Stress 1,000 lb/in²	Tensile Strength 1,000 lb/in²	Elongation per cent	Reduction of Area per cent
J-1570 (KA-173X)	1,000	75·0	143·6	32·0	35·9
	1,200	75·8	145·0	20·3	20·0
	1,400	88·6	118·7	5·5	11·0
	1,600	66·5	68·7	19·0	23·0
GMR-235 (KA-215X)	1,100	109·7	167·5	20·4	31·5
	1,300	117·1	148·1	16·4	21·8
	1,600	77·3	79·0	18·0	25·8
Udimet 500 (KA-277X)	1,000	121·7	171·4	22·8	22·6
	1,200	117·8	169·5	21·9	19·2
	1,400	121·3	134·5	17·1	19·1
	1,600	84·4	86·4	8·3	7·6
M-252 (KA-195)	1,000	94·2	144·4	31·7	36·2
	1,200	91·8	151·9	35·5	27·0
	1,400	87·2	115·0	25·2	30·5
	1,600	70·5	71·2	39·5	55·5
Waspaloy (KA-175)	1,000	106·0	172·0	22·7	24·1
	1,200	100·2	163·4	33·4	32·0
	1,400	99·8	117·2	27·8	40·8
	1,600	75·7	76·2	34·7	54·0

Nominal strain rate 0·05 *in/in/min.*

TABLE IV—STRESS-RUPTURE DATA

Alloy	Test Temperature (°F.)	Rupture Stress 1,000 lb/in²	Rupture Life (hr.)	Elongation per cent	Reduction of Area per cent
J-1570 (KA-173X)	1,000	141·3	0·1	31·3	36·9
	1,200	105·0	590·3	16·5	13·0
	1,400	51·0	609·2	6·9	9·0
	1,600	19·0	507·8	27·3	39·4
GMR-235 (KA-215X)	1,000	152·5	67·2	18·3	24·1
	1,200	110·0	115·9	5·0	9·8
	1,400	60·0	75·5	7·7	39·3
	1,600	28·0	85·3	12·0	29·4
Udimet 500 (KA-277X)	1,000	162·0	251·9	22·7	22·4
	1,200	120·0	105·7	4·5	10·7
	1,400	75·0	34·6	3·1	3·0
	1,600	30·0	64·9	8·7	11·4
	1,650	25·0	38·8	26·2	25·7
	1,650	25·0	36·0	20·2	26·9
M-252 (KA-195)	1,000	145·9	0·1	30·0	38·7
	1,200	102·0	219·6	11·1	16·1
	1,400	60·0	90·6	38·3	42·9
	1,600	26·0	65·2	35·0	46·1
Waspaloy (KA-175)	1,000	155·0	73·0	25·3	21·6
	1,200	102·0	235·5	13·0	19·1
	1,400	60·0	127·4	17·0	29·4
	1,600	30·0	39·5	24·9	38·4

a range of temperature and stresses in order to obtain design data which might be utilized in applying these new alloys. For this purpose, five alloys—J-1570, GMR-235, Udimet 500, M-252 and Waspaloy—were chosen for extensive tests. The grade, heat number and chemical analyses of these heats are shown in Table I. All of the heats were melted in the 1,000 lb. vacuum induction furnace, which has since been modified to increase its capacity to 2,000 lb. The manganese and silicon contents of all of these materials were less than 0·02 per cent. In addition, the titanium and aluminium contents of the Waspaloy heat have been increased to be consistent with new specifications issued on a basis of vacuum melting procedures. Boron was added to all heats (0·1 per cent in the GMR-235 and 0·0018 to 0·006 per cent in the others), and zirconium additions (0·04 to 0·1 per cent) were made to J-1570, Udimet 500 and M-252.

Heat-Treatment

The heat-treatments used for the various grades are shown in Table II. All the tests were conducted on specimens machined from bar stock approximately $\frac{3}{4}$ in. diameter. Although GMR-235 was developed as a casting alloy, vacuum melting enables the material to be forged and rolled with little difficulty. This particular heat was fabricated from a 9 in. ingot to $\frac{7}{8}$ in. diameter bar stock for this evaluation.

Elevated temperature tests were conducted on the heat-treated specimens utilizing a nominal strain rate of 0·05 in/in/min. at temperatures from 540°C. to 870°C. The results of these tensile tests are given in Table III. Stress-rupture tests were also conducted at various temperatures in this same range at stresses chosen on the basis of the previously determined tensile results. The results of these rupture tests are reported in Table IV.

These tests show that for M-252, Waspaloy and GMR-235 vacuum melting, plus the pertinent compositional modifications, has resulted in a significant improvement in rupture properties over the entire temperature range investigated.

The first specification for air melt Waspaloy required a rupture life of 23 hr. at 816°C. and 27,500 lb/in². After considerable melting experience, this stress level was increased to 32,500 lb/in². There was no ductility requirement in the air melt specification. As a result of first vacuum melting efforts, it was possible to increase this specification to 40 hr. at 816°C. and 37,500 lb/in², and to incorporate a minimum elongation of 5 per cent. Later on, the stress was increased to 40,000 lb/in², the rupture life to 55 hr. and the elongation to 10 per cent and still more recently, primarily as a result of controlled boron and zirconium additions, the rupture life under these same conditions of 816°C. and 40,000 lb/in² has been increased to 75 hr.

It should be pointed out that the tensile and rupture properties of super alloys intended for bucket materials are generally based on fabrication and heat-treatment practices which have been tailored to produce the best combination of tensile strength, rupture strength and ductility. Variations in either forging practice or heat-treatment can be used to emphasize any of these properties at any given temperature. At temperatures below 732°C., optimum tensile properties can be

TABLE V—EFFECT OF BORON AND ZIRCONIUM ADDITIONS

	Nominal Additions			
Heat	Boron per cent	Zirconium per cent	Rupture Life (hr.)	Elongation per cent
KA-161	0·00	0·00	48·6	5·4
KA-162	0·01	0·00	77·5	18·7
KA-163	0·01	0·10	88·0	17·6

TABLE VI—EFFECT OF BORON AND ZIRCONIUM ADDITIONS

	Nominal Additions			
Heat	Boron per cent	Zirconium per cent	Rupture Life (hr.)	Elongation per cent
KA-193	0·005	0·05	80·9	19·1
KA-199			88·0	20·1
KA-194	0·005	0·10	71·6	27·8
KA-195			89·4	19·2
KA-197	0·01	0·05	66·0	31·3
KA-200			92·6	19·5
KA-196	0·01	0·10	71·2	22·6
			91·4	17·8
Average of Low Boron Heats			82·4	21·5
Average of High Boron Heats			80·3	20·3
Average of Low Zirconium Heats			81·8	20·0
Average of High Zirconium Heats			80·9	21·8
Average of All Heats			81·4	22·2

TABLE VII—TEMPERATURE RATINGS OF VACUUM MELTED ALLOYS

Grade	Temperature Rating (°F) Basedon 100 hr. Rupture Life at 20,000 lb/in.²*	
	Air Melted	Vacuum Melted
J-1570	—	1,650
GMR-235	1,640	1,670
Udimet 500	—	1,670
M-252	1,570	1,625
Waspaloy	1,570	1,630

**Based on parameter plots of rupture data.*

obtained with a fine grain size; whereas, at higher temperatures or for longer times, as in a rupture test, larger grain size is an advantage.

Fabrication and heat-treatment also have an important role in determining the combination of rupture life and ductility produced in these materials. Increasing amounts of cold work or hot work prior to solution treatment appear to lower the ductility for a given rupture life. Vacuum melting with no changes in composition can be considered to increase the rupture ductility, with a minor improvement in rupture life. At this higher ductility level, it is then possible to incorporate increased alloy content and obtain a net result of both increased rupture life and ductility. Boron and zirconium are elements which appear to have the facility for increasing both rupture life and ductility, and utilization of these elements results in still higher rupture life and ductility than possible with vacuum melting and increased hardening additions alone.

Additions to Melts

Due to the potent effects of small quantities of boron and zirconium, the question has been raised concerning difference in properties due to uncontrollable variation in boron and zirconium content. As mentioned previously, the effect of the first small amounts of boron and zirconium is quite potent, but at higher levels the increase in properties levels off somewhat, so that the scatter due to variations in these elements is minimized. This is shown in Tables V and VI. In Table V, the effect of 0·01 per cent boron compared to a 0 per cent boron heat can be clearly seen, and the addition of 0·1 per cent zirconium has a slight effect on rupture life. Table VI illustrates the consistency of rupture life and ductility in several heats of M-252, in which the boron was varied intentionally from 0·005 to 0·01, and the zirconium from 0·05 to 0·1 per cent. These are the maximum variations that should be encountered in vacuum melting this type of alloy with controlled boron and zirconium additions. Comparison of the average rupture life and ductility of the low and high boron, and low and high zirconium heats, illustrates that variations in these elements in the ranges studied should have no significant effect in inducing scatter.

Table VII gives the temperature ratings based on 100 hr. rupture life at 20,000 lb/in² (as determined from the parameter plots) for the vacuum melted materials studied in this investigation. These properties are merely an indication of what can be expected in the next few years as a result of intensive alloy development programmes now under way. It appears entirely possible that forged nickel- or cobalt-base alloys can be developed which will have a 100-hr. rupture life of 20,000 lb/in² at temperatures approaching 980°C. At the present time, this would appear to be the ultimate attainable in these systems, and further increases in service temperatures of jet engines will undoubtedly require the use of refractory metals, such as molybdenum, for the critical bucket application. When this occurs, however, the overall increase in engine temperatures will dictate the use of nickel- and cobalt-base alloys as turbine wheel—or even compressor wheel—materials. In addition, the new fields of ram jet and rocketing will undoubtedly find many uses for these alloys in sheet form.

To summarize, this new processing technique has permitted increased operating temperatures in jet engines by its effect on high temperature strength and ductility, enabled metallurgists to utilize more efficiently, and in larger quantities, the alloying elements known to improve high-temperature strength, and it has stimulated research into the fundamentals governing high-temperature strength.

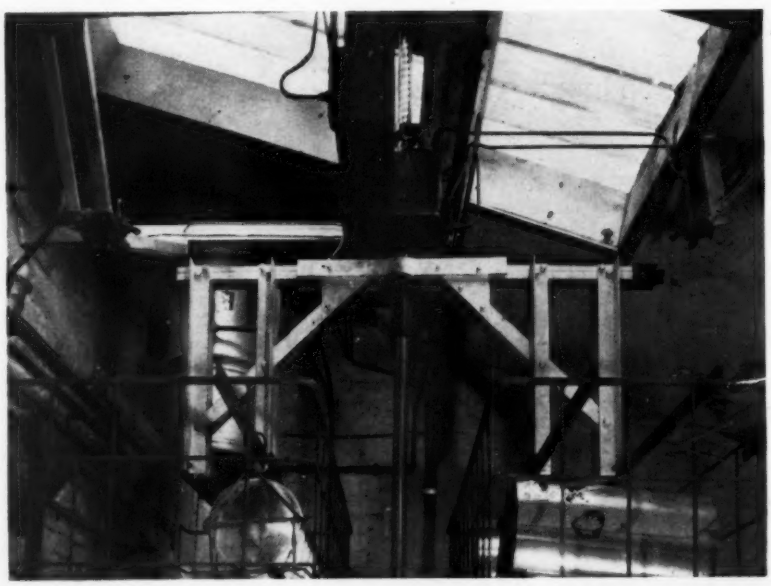
Twin-Basket Degreasing

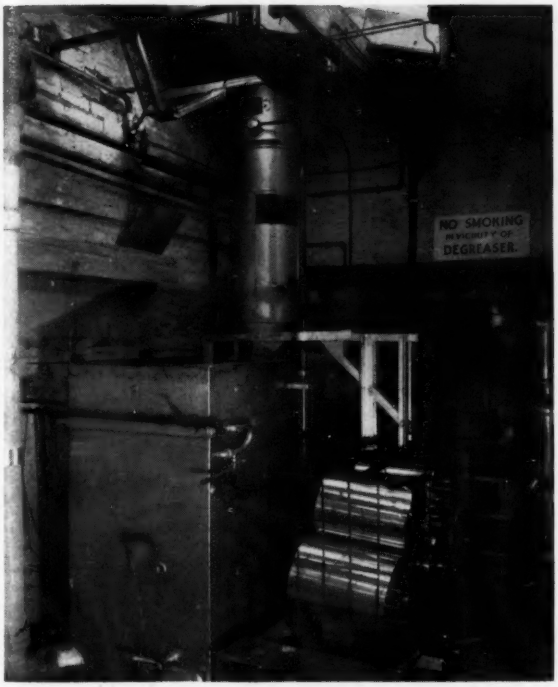
ENGAGED in the manufacture of churns from heat-treated aluminium alloy, Grundy (Teddington) Ltd., Middlesex, have installed a mechanical degreasing system which ensures that maximum use is made both of the operator's time and of the degreasing tank, for two loading baskets are employed. These are attached to a yoke and raised by a vertical cylinder after the basket outside the tank has been loaded with components through a gate. Contents of the companion basket are immersed, while the other is being loaded, in the degreasing fluid. The supply to the raising cylinder is air on oil to give steady operation. The installation uses Martonair pneumatic equipment and was described in *The Journal of Applied Pneumatics*.

When the two rising baskets reach a certain height the yoke engages in dogs on the torque unit, while the framework — by tripping a roller-operated valve—causes the torque unit to rotate.

When the unit has completed a 180° movement, the baskets have changed place and a second roller-operated valve is tripped, causing the yoke to descend. The basket of degreased components is then presented for unloading, and after it has

The framework of the degreasing installation with the two baskets in the "up" position. The two sets of dogs are just about to engage below the torque unit, and the trip will soon strike the roller-operated valve





The basket outside the tank of the degreasing outfit has been loaded with churn components

been reloaded with fresh components, the push-button valve on the wall is depressed to begin another cycle. Meanwhile, the other batch is, of course, in the degreasing tank and a time delay system is incorporated to ensure that the cycle does not restart —even though the wall button has been pressed—until these are ready to come out.

Foundry Fume Removal

DUST and fume collection presents a number of problems in non-ferrous foundries, and the introduction of a collecting system, which moves with the pouring ladle but still exhausts through the main stack, has done much to overcome these problems at the works of Langsenkamp-Wheeler Brass Works Inc., according to *Modern Castings*.

The equipment is simply: (1) a metal hood positioned over the pouring ladle and anchored to the holding carriage; (2) a flexible tube leading from the hood to the overhead duct; (3) a centrifugal blower that draws 2,500 ft^3/min. of air into the system through the hood and exhausts it out of the stack.

Before solving the foundry atmosphere problem, the conventional approach—installing several large fans in the foundry roof—had been tried. These fans were capable of exhausting 200,000 ft^3/min. of air from the foundry. But still zinc fumes hung over the pouring floor and zinc oxide fell on the men. During winter, exhausting this large volume of heated air involved considerable expense and created draughts in the shop.

A crucible of molten brass is brought into the pouring area by overhead monorail from the melting room. A sheet metal hood is then attached to the crucible carriage with a quick-locking clamp. This hood, positioned about 6 in. above the crucible, is a stainless steel semi-circle of 14 in. diameter.

A 6 in. diameter flexible tube is the link between the stainless steel hood and an overhead collector duct mounted on top of the monorail. This tube is wire-bound, neoprene-coated fabric. It is so flexible that the ladle can be rotated 360° and the tube will wrap itself around the vertical ladle support without difficulty.

The upper end of this flexible tube connects to a transition box on wheels, so that it can roll back and forth in a direction parallel to the bridge crane monorail.

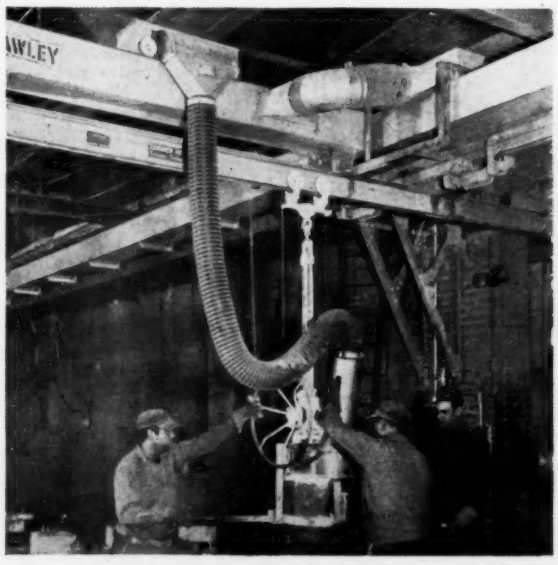
Moulds are set in rows with aisles running in the same direction as this overhead monorail. This arrangement permits pourers to move back and forth in one aisle pouring moulds on both sides. After moulds adjacent to one aisle are poured, the bridge crane is moved down the shop until the overhead rail is centred above the next aisle.

The transition box is of a design that allows it to move back and forth and yet maintain a closed circuit in the duct system. This is possible because the collector duct on which the box is rolling has only three metal sides. The top side is a canvas belt fitting snugly in a groove on each side. The canvas belt is threaded through a set of rollers within the transition box in such a way as to create an opening into the collector duct.

A similar transition box is used as the connecting link between the collector duct and the main duct running down the shop next to the wall. This main 9 in × 11 in. duct, 118 ft. long, extends the entire length of the pouring floor.

Near each end of the main duct, a 3 h.p. paddle-type blower is installed which draws air from the duct and blows it into a 9 in. round exhaust pipe leading to a brick exhaust stack 60 ft. high.

Results have proved so satisfactory that even after pouring 5,000 lb. of superheated 85:5:5:5, the atmosphere in the pouring area is as clear as in the foundry superintendent's office. With only 2,500 ft^3/min. of air being removed the air movement is not noticeable 3 ft. from the exhaust hood over the pouring crucible.



The arrangement of the transition box, hood and flexible tube for removing fume from the crucible during pouring

Men and Metals

Recent appointments made by Isotope Developments Limited are as follows:—**Mr. J. S. Eppstein,** B.Sc., A.C.G.I., to be chief engineer. He has been head of the electronics division since joining the company in 1951 and in this capacity was responsible for the

electronic design of nuclear instrumentation for reactors, industrial equipment such as thickness, level and density gauges, and laboratory instruments for tracer experiments, medical uses of radioisotopes, etc. He was previously at A.E.R.E., Harwell. Appointed technical manager to the

company is **Mr. R. Y. Parry,** whose previous experience in nucleonics was gained with E. K. Cole Limited. Mr. Parry was chairman of the Nucleonics Group, S.I.M.A., from 1955 to 1957, and is a member of the B.S.I. Committee on Glossary of Terms used in Nuclear Science.

News from the Worcester Brass Company Limited is to the effect that **Mr. Philip R. Prior,** a director and general manager of the company, has been appointed managing director. He succeeds **Mr. G. R. Prior,** who has retired from that position but remains in an advisory capacity.

It is announced by Kelvin and Hughes (Industrial) Limited that they have appointed **Mr. V. P. Scholes** as area representative for the Midlands. Mr. Scholes will be resident in Birmingham.

After 36 years' service with the Expanded Metal Company Limited, **Mr. John Taylor** has retired. He was appointed works manager in 1947 and became a director soon afterwards. He will continue to serve as a director. Mr. Taylor is succeeded as works manager by **Mr. H. P. Salmon,** who is also a director.

From the Gauge and Tool Makers' Association it is learned that the officers of the Association for the past session have been re-elected for the present year as follow:—President, **Mr. F. W. Halliwell,** C.B.E., M.I.Mech.E.; deputy president, **Sir Stanley Harley,** B.Sc., M.I.Mech.E.; vice-presidents, **Mr. A. L. Dennison, Mr. H. S. Holden** and **Mr. T. Ratcliffe;** chairman, **Mr. L. E. Van Moppes;** vice-chairmen, **Mr. G. P. Barrott** and **Mr. R. Kirchner,** M.I.Mech.E.

In succession to **Mr. W. L. Heywood,** who has resigned on taking up an appointment as a member of the Restrictive Practices Court, the Lord President of the Council has appointed **Mr. Lewis T. Wright** to the Council for Scientific and Industrial Research. Mr. Wright is chairman of both the Production and Scientific Advisory Committees of the Trades Union Congress and is also chairman of the British Productivity Council.

Formerly Minister of Trade and Commerce in the Government of Canada, **Mr. C. D. Howe** has been elected a member of the board of Aluminium Limited.

From the Zinc Corporation Limited it is learned that **Mr. A. G. Davies** has been appointed a director of the Corporation, and **Mr. D. M. G. Sneddon** has been appointed a director of Imperial Smelting Corporation Ltd.

It is announced by The British Oxygen Company Limited that **Mr. T. E. Potts** has been appointed a managing director of the company.

In succession to **Mr. C. Coulson-Smith,** who has retired, **Mr. Malcolm Turner Clark** has been appointed chief chemist at the Cricklewood laboratory of British Oxygen Gases Limited. Mr. Clark has been at the Cricklewood laboratory for the past 27 years and his activities recently have been concerned with the production control of acetylene.

On his retirement from the board of directors of Almin Limited, **Mr. Spence Sanders** has relinquished the chairmanship of the Fulmer Research Institute at Stoke Poges. He is succeeded as chairman by **Mr. W. R. Merton.** Appointed to the board of directors of the Institute is **Mr. J. G. Graham,** A.C.A.

It is reported that **Mr. H. Wilmot** has been appointed a director of the Anti-Attrition Metal Company. **Mr. M. J. B. Whitby** and **Admiral Sir Maurice Mansergh** have resigned from the board.

Flame Control

TWO new flame-failure controllers have been designed by Ether Ltd., Tyburn Road, Birmingham, 24, to combat running flame failure in gas- or oil-fired systems. The first of them, the Type 700, is semi-automatic and the second, the Type 701, is a fully-automatic relight unit.

Instead of using sensing electrodes, the controllers employ an infra-red sensitive photo-cell (protectively housed and fitted with a toughened glass lens). The photo-cell reacts instantly to flame failure and when this occurs an electronic control unit immediately shuts off the fuel supply. It is interesting to see that the design of the electronic circuit is such that the controllers are sensitive to flame only and completely ignore radiation within the heating chamber.

The Type 700 unit is designed for manual, electrical ignition of gas- or oil-fired furnaces, and has provision for an automatic purge cycle. The rather more ambitious Type 701 unit is designed for the completely automatic operation of almost all types of gas- or oil-fired furnaces. It has an automatic purge and ignition cycle, thus ensuring that should flame failure occur both pilot burner and main burner are shut off instantly and, after the purging cycle, are automatically re-lighted.

Also introduced by this firm is a new temperature-controller, the Thermal-trol Type 750. This instrument, which employs no galvanometer, has an extremely wide range, being able to control temperatures between −200°C. and 1,000°C. for electrical, steam, gas- or oil-fired apparatus, with considerable accuracy and speed.

The temperature-sensitive element is a platinum-wire resistance, or thermo-bulb, in which the resistance changes in proportion to its temperature, thus causing an unbalanced condition in the A.C. bridge-circuit. A relay opens or closes an electrical circuit, depending on the phase angle of the input voltage to the amplifier. This system is independent of amplifier-gain and is extremely stable.

The control-circuit is of a simple design which uses a minimum number of components and should ensure trouble-free, continuous operation.

The Ether Thermal-trol has a 7 in. indicating scale. The instrument is not affected by vibration or ambient temperature. It is suitable for wall or panel-mounting.

Finishing Supplement

Effluent Problems

By F. WILD, A.I.M.
(*R. Cruickshank Ltd.*)

I—LEGAL ASPECTS

Dealing in detail with the legal, chemical treatment, and treatment plant aspects of the problem presented by the effluents arising from electroplating operations, this Paper was presented recently at the Midland Branch of the Institute of Metal Finishing. The part which appears here deals with some of the Acts and Bye-laws controlling effluent disposal. Further sections, dealing with chemical treatment and with treatment plant, will appear later.

PROBLEMS of disposal of effluents, from premises carrying out electroplating and other chemical surface treatments of metals, are not new, but with the attention being paid to them by Local and Government Authorities they are matters of ever-increasing importance. For many years, industry and local authority has tended, in many cases, to take a very tolerant view of the matter, but with the increasing use of chemical processes in engineering and other industries, the problem has reached such proportions that authorities are now enforcing the laws governing effluent disposal.

The laws and bye-laws governing effluent disposal vary considerably from one area to another, and whilst some authorities demand high standards of treated effluent, others allow the disposal of untreated effluent into the sewers.

The main factors which seem to control these variations in standards are the type of effluent, the proportion of industrial or toxic effluent to domestic effluent in the particular area, pressure by interested bodies, e.g. holders of fishing rights who are concerned to maintain the fish life in certain rivers, and whether an effluent is discharged directly into a river or passes through the local authority's sewage system.

Discharge into Rivers

Direct disposal into rivers is covered by a number of Acts of Parliament, the main being

(i) The Public Health Act of 1875, which provided for the removal of foul matter from sewage before discharge into a river.

(ii) The River Pollution Prevention Acts of 1876 and 1893, which dealt with both sewage and liquid trade waste.

(iii) The Salmon and Fresh Water Fisheries Act of 1923, which prohibited the discharge of any material that destroys fish or fish food into a river or stream.

(iv) The River Board Act of 1948.

(v) The River (Prevention of Pollution) Act 1951.

(vi) The River (Prevention of Pollution) (Scotland) Act 1951.

The three most important of these are the 1948 Act, the 1951 Act, and the 1951 (Scotland) Act.

Under the River Board Act of 1948, which empowered the River Boards to take over the duties of Fishery Boards, Catchment Boards, River Pollution Prevention and Local Authorities, the River Boards are responsible for the administration of the Rivers (Prevention of Pollution) Act 1951. The 1951 Act deals with prevention of pollution, the setting up of standards for effluent, and new discharges into rivers, streams and tidal waters.

The 1948 Act gives River Boards power to direct firms to give information concerning water abstraction from rivers, and discharge into rivers, and also to take samples of effluent.

The term "pollution" is defined as "an act which changes the natural qualities of the water in a river or stream"; this may be taken as increase in temperature or the addition of hard to soft water, and although the "change" may be harmless it is, nevertheless, held in law to constitute pollution.

Under the 1951 Act, Section 2, any factory discharging effluent into a river or stream, whether the effluent be harmless or not, could be in danger of prosecution. This eventuality, however, is provided for under the 1951 Act, which states that a River Board may not institute proceedings, unless bye-law standards are in force, without the consent of the Minister of Housing. However, in 1958, seven years after the passing of the Act, the consent of the Minister is not necessary. Another protection is given to the manufacturer under Section 2(3) of the 1951 Act, in that it is a good defence to show that the effluent could not have otherwise been discharged, and that all reasonable practical steps are being taken to treat the effluent.

Bye-law standards for composition of effluent are gradually being formulated, and the standards proposed by the Trent River Board are that an effluent is regarded as "below standard" if:—

(a) It contains solids in suspension in excess of thirty parts per million by weight.

(b) It includes matter which causes oxygen to be absorbed from N/80 potassium permanganate in 4 hr. at 26·7°C. (80°F.) in excess of twenty parts per million by weight (O.A. test).

(c) It includes matter which takes up dissolved oxygen in five days at 18·3°C. (65°F.) in excess of twenty parts per million by weight (B.O.D. Test).

(d) It has a hydrogen ion concentration (*p*H) of less than 6 or more than 9.

(e) It has a temperature in excess of 26·7°C. (80°F.) or causes the temperature of the water in the stream not less than 100 yards downstream from the point of entry to be higher than the temperature of the water in the stream immediately above the point of entry by more than 6·6°C. (12°F.).

(f) (i) It includes arsenic, chromium, copper, lead or zinc in excess of one-tenth part per million by weight; (ii) it includes cyanide (CN) in excess of one-tenth part per million by weight; (iii) it includes free chlorine in excess of one part per million by weight.

More stringent limits in standards (a) to (d) are called for in respect of discharges made to streams earmarked for domestic water supply. The limiting figures given for solids in suspension may, however, be relaxed to some extent according to the nature of such matter and the overall effect on the stream concerned.

The limiting figures given in standard (f) above are so prescribed as to be practically a total prohibition of the polluting matter indicated thereby, but on declaration of the unavoidable presence of such matter in a particular effluent, the prescribed limits may be raised to not more than one part per million, according to the stream dilution in each case.

The 1951 (Scotland) Act is similar to the 1951 (English) Act, except that it is administered by River Purification Boards, which consist mainly of interested parties, e.g. agriculture, local authorities and industry. Under this Act, the Board may accept effluent of lower standard than allowed by the bye-laws, where there is difficulty in treatment.

In the London area, where river water is supplied to the Metropolis, the Thames and Lee Conservancy Boards have several Acts which are much stricter than the 1951 Act.

The foregoing legal position is entirely separate from private actions of Common Law, which may be brought against industrial concerns

I.M.F. Midland Centre

DINNER — DANCE

SOME of those present at the annual dinner-dance of the Midland Centre of the Institute of Metal Finishing, held last week at the Grand Hotel, Birmingham, are shown in the pictures on this page.

Left : Dr. and Mrs. T. P. Hoar (President, I.M.F.), Mr. G. Dance, Miss M. Floyer, Dr. D. N. Layton (Chairman, Midland Centre)

Mr. and Mrs. J. W. Weaver, Mr. and Mrs. D. J. Bouckley, Mr. and Mrs. A. G. Benning, Mr. and Mrs. E. Blewett, Mr. and Mrs. L. C. F. Oliver, Mr. R. McManus, Mr. and Mrs. C. Postins

Mr. and Mrs. D. Haywood, Mr. and Mrs. P. Donnelly, Mr. and Mrs. C. Leek, Mr. and Mrs. N. Leek, Mr. and Mrs. T. C. Leek, Mr. and Mrs. E. Scrimgeour, Mr. Clegg, Mr. A. Baldock

Mr. and Mrs. Hope, Mr. and Mrs. P. Winter, Mr. Bradwell, Mr. and Mrs. E. Baynham, Mr. S. Roberts, Mr. E. A. Baker, Miss M. Hurst

Mr. and Mrs. K. F. Neale, Mr. and Mrs. V. L. Wakelin, Mr. and Mrs. G. O. Evans, Mr. and Mrs. J. B. Rowland

Mr. I. T. Watkins, Mr. and Mrs. Plant, Mrs. S. J. Mason, Mr. and Mrs. Butterworth, Mr. and Mrs. J. Bulman, Mr. E. Bulman, Miss M. Langshaw, Mr. and Mrs. Vale, Miss C. Jones

Mr. and Mrs. N. A. Tope, Mr. and Mrs. Brown, Mr. and Mrs. Salvage

Mr. and Mrs. A. Smart, Mr. and Mrs. L. S. Lowery, Mr. and Mrs. T. Bryant, Mr. A. E. Abbott, Mr. and Mrs. G. F. Challinor, Mr. and Mrs. J. Murray, Mr. E. Burt

Mr. and Mrs. Grant, Mr. and Mrs. Dingley, Mr. Abbott, Mr. and Mrs. James

and local authorities in order to protect fishery and other rights.

Drainage into Public Sewers

The Acts dealing with disposal of effluent into public sewers owned by the local authorities are:

(1) The Public Health Act, 1936, which gives any occupier of premises the right to connect his drains into the public sewer, for the discharge of foul and surface water from the premises.

(2) The Public Health (Drainage of Trade Premises Act) 1937, which applies only to England and Wales, but not to the London area.

(3) The London County Council (General Powers) Act 1953. This Act, which replaces the Public Health (1936) London Act, gives the Council much stronger powers in the control of effluent standards.

Under Section 2 of the 1937 Act, any manufacturer who wishes to discharge new sewage into public sewers must serve a trade effluent notice on the local authority stating:—(i) The nature or composition of the trade effluent; (ii) maximum quantity to be discharged in one day; (iii) the highest rate of discharge.

This notice must be served two months before the effluent is discharged. In this time, which may be lengthened, the local authority may specify conditions as to:—(i) The sewer into which the effluent may be discharged; (ii) the nature or composition of the effluent; (iii) the maximum quantity which may be discharged in any one day; (iv) highest rate of discharge; (v) any other matter regarding which bye-laws can be made under the Act.

The local authority may also make bye-laws providing for:—(i) The period or periods during the day when effluent may be discharged; (ii) the elimination of material injurious to sewers; (iii) the maximum temperature (usually 110° F.); (iv) *p*H limits (usually *p*H 6-9); (v) charge for receiving and treating effluent; (vi) provision of a meter and manhole for sampling; (vii) the exclusion of condensing water.

All these bye-laws are, however, subject to appeal to the Minister of Housing.

It will be seen under the 1937 Act, that the control only applies to new effluent discharges since March 3, 1937, and any manufacturer who had discharged effluent into the public sewer during one year prior to that date could lawfully continue to do so without the consent of the local authority, provided that the nature and volume of the effluent remained unchanged, and the maximum daily discharge was not exceeded, and also the highest rate of discharge in the year was not exceeded. Prescriptive right in such cases is difficult to prove, and the Act provides for arbitration by the Minister in disputes between manufacturers and local authorities.

Under the London County Council (General Powers) Act 1953, similar powers to the 1937 Act are granted, with the exception that no changes are made for acceptance of trade effluent, and the Council may also serve notice of proceeding on premises which discharged prior to the Act, if the Council consider the effluent to be harmful in any way either to sewers or sewage treatment processes.

From the foregoing, it will be seen that where discharges are made direct into rivers, whether by manufacturers or by local authorities, the River Boards Act 1951 controls the disposal, and where manufacturers dispose effluent into the public sewers of the local authority, the manufacturer is responsible to the local authority under the 1937 Public Health Act or the 1953 London County Council Act, whichever is applicable.

One other important point is that surface drainage water is generally under the authority of the River Board and any manufacturer who disposes of toxic effluents by allowing them to run into soak-away pits may find himself in trouble with the River Board, whose standards are usually more strict than the local authority.

In Birmingham, for instance, the local authority has in the past imposed the following standards for industrial effluent:—(a) The *p*H to be greater than *p*H6; (b) the limiting amounts of soluble salts of copper, chromium, nickel, cadmium, tin, lead and zinc to be an inclusive figure of ten parts per million; (c) the limiting amount of suspended solid to be 400 parts per million; (d) the limiting amount of cyanide, excluding ferrocyanide, to be ten parts per million.

In addition to this, a charge is made for acceptance of effluent based on volume and quality of the effluent.

Effects of Toxic Materials

The main materials which are contained in effluents from premises carrying out electroplating and allied processes are nickel, chromium, zinc, tin, lead, cyanide, copper, cadmium, acid and alkali, both as soluble and insoluble materials.

In general, the local authorities require the removal of solid matter in suspension in excess of 400 parts per million, *p*H limits of 6-10, and a temperature below 110° F. The amount of toxic materials such as chromium, nickel, zinc, other metals and cyanide, are dependent on the size of the sewage works and ratio of effluent to general sewage.

The general principle of sewage treatment by local authority is a biological process for the treatment of organic matter and also a settling out of suspended matter as sludge in settling tanks. Any toxic material will inhibit the biological oxidation of the sewage, and if excess toxic material is present it may stop the process entirely.

However, Pettet mentions the use of one organism, an actinomycete, which can be used to break down cyanide to ammonia and carbon dioxide, and tests have shown its ability to deal with solutions containing up to sixty parts per million of HCN.

There is also the question of chemical attack on sewers, the attack of strong acid on mortar and metal being well known, and the discharge of strongly-acid effluents may cause serious damage to sewer pipes, as well as affecting the sewage treatment. As well as this, the presence of cyanides in sewers can be a source of danger to workmen, due to evolution of HCN gas, and a figure of twenty parts per million for short periods and ten parts per million for long periods has been quoted as being dangerous.

Solid material, and materials, such as chromate, which precipitates out, can also cause trouble in sewers due to deposition of sludge and subsequent blockages.

Interference in the treatment of general sewage at the sewage works can be caused by as little as one part per million chromate, one part per million cyanide as HCN, one part per million of copper, or two parts per million of nickel.

It must, however, be remembered that trade effluent is generally diluted by domestic and other sewage, and the standards which may be set by the local authority will vary according to the volume of trade effluent in relation to other non-toxic effluent.

In circumstances where effluent is discharged direct into a river or stream, the standards which may be set are likely to be much more critical, as there is no dilution by other non-toxic sewage.

Various workers have carried out toxicity tests on fish, using cyanide, and the general toxicity threshold would appear to be 0·02 parts per million cyanide (as CN). It has been found, however, that increase in temperature or "oxygen content" lowers the threshold figure, and it is an interesting fact that fish removed from toxic water, revived in non-toxic water and returned again to toxic water, have gained a certain amount of immunity to cyanide poisoning.

The discharge of metallic salts, such as copper and zinc, into streams or rivers may also prove toxic to fish life, and prevent the biological oxidation of organic polluting matter.

(*To be continued*)

Bright Annealing

IN the article "Bright Annealing Copper Wire" (METAL INDUSTRY, 20 December, 1957, p. 518) the output of the Metalectric furnace in operation at the works of W. T. Glover and Co. Ltd. was given as 44 tons/week. We have now been informed that the figure should be between 160 and 180 tons/week, depending upon whether the load consists of coils or 1,000 lb. reels.

Products and Processes

TRENDS IN THE DEVELOPMENT, APPLICATION, PROCESSING, DESIGN AND WORKING OF NON-FERROUS METALS AND THEIR PRODUCTS

Birlec-Morgan Electric Diecasting Furnace

FOLLOWING extensive trials in the test foundry of the Morgan Crucible Co. Ltd., it has been found that, using the Birlec-Morgan Electric Diecasting Furnace, aluminium can be allowed to solidify and be remelted in both Salamander Super and Suprex basins without damaging them. The only precaution needed is to ensure that the charge is completely molten and to avoid adding any solid metal just before switching off.

It is the even, gradual heating of the "EDF" which makes this possible. The practice cannot be recommended for oil- or gas-fired furnaces.

A time switch is now fitted as standard to take full advantage of this new labour-saving procedure. It will automatically switch the furnace on and off at preselected times. Emptying the furnace by baling-out at night is avoided and the metal is automatically brought to the required temperature at starting time the following morning.

It will normally be cheaper to remelt the solid charge than to maintain a bath of molten aluminium overnight. For example:—For overnight 15 hr. shut-down period, maintaining 300 lb. aluminium at 720°C.: 15 hr. maintaining at 9 kW = 135 kW used. Time switching furnace off for 11 hr.; automatically switched on for 4 hr., remelting: 4 hr. melting at 24 kW/hr. = 96 kW; saving = 39 kW = 28·8 per cent.

It will be appreciated that this development renders the Birlec-Morgan Electric Diecasting Furnace completely automatic. The die-caster using an "EDF" has no furnace operation duties and can spend the whole of his time diecasting.

Salt Bath Heat-Treatment

FROM time to time decided improvements have been made in the design of salt bath furnaces and, following the advent of electrically-heated baths, further impetus to their acceptance by industry has been given by the development of electrode design, particularly the introduction of quick-release devices and totally-submerged electrodes. Recently introduced in this country by Electric Resistance Furnace Co. Ltd. is the Efco-Upton continuing graphite electrode bath. As the name implies, the main advantage is the ability to renew electrodes without taking down any part of the furnace brickwork.

The electrodes consist of cylindrical graphite rods, which are fed horizontally through opposing walls at the bottom of the refractory lining as they are consumed, and whilst the furnace is still in operation. Moreover, a fresh electrode can be attached to the screw feed device again without interrupting operation of the plant. This means that the full life of the furnace lining can be utilized, an advantage which has never before been possible with submerged electrodes. Since the electrodes are submerged with the end faces only exposed to the salt, electrode wear is reduced to a minimum and their life increased.

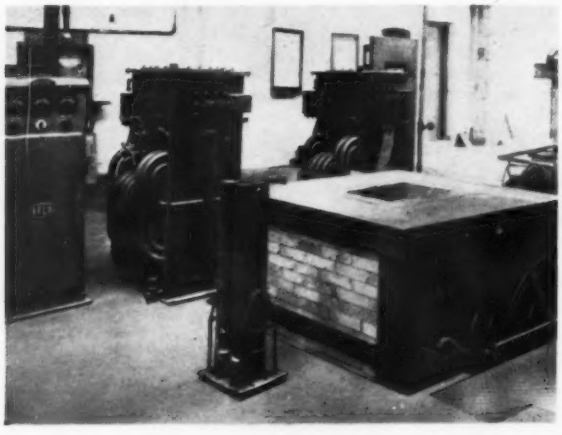
With the special dense high-temperature bricks which are used, a lining life of 12-18 months is achieved at high-speed steel hardening temperatures, three years on neutral hardening up to 1,000°C., and on aluminium brazing a life of five to 10 years is not uncommon. In addition, the special lining bricks used result in a negligible amount of salt absorption into the lining, whereas with conventional refractory linings practically the same volume of salt is absorbed by the brickwork as is contained in the actual pot. This point is of particular importance in high-speed and brazing baths, where the salt (or flux) is a comparatively expensive item.

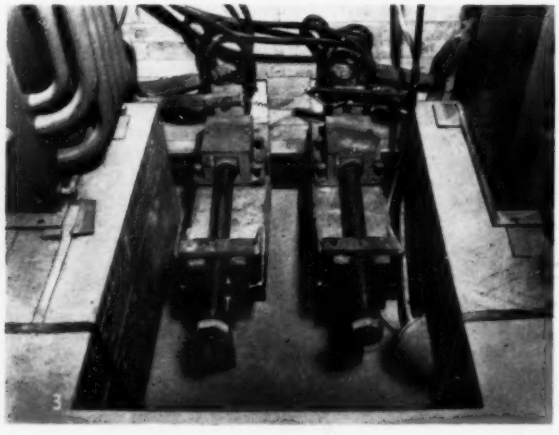
Another perhaps slightly less obvious advantage is that with the electrodes located in the very bottom of the bath, the entire exposed surface of the salt and operating depth is available as work space. Again, the absence of any metal, resulting in the presence of metallic oxides in the bath, facilitates maintenance of the neutrality of the salt in hardening operations and obviates premature breakdown of the flux in aluminium brazing.

Reducing Wear of Soldering Bits

RECENT work by G. Laubmeyer, which was reported in *Tin and its Uses*, indicated that the objections to copper in solder, although very real and serious in the case of dipping baths, probably did not extend to solders which would be used in wire form or stick form, and which merely required to be made molten instantaneously and then could be allowed to cool quickly. Laubmeyer was able to show that sufficient copper—of the order of one-and-a-half per cent of the weight of the solder—could be introduced into wire and stick solders without adversely affecting either the strength or ductility of them. The tin-copper compound could, with proper care, be obtained in very fine crystalline form in the wire or stick, and then presented no difficulties when used with a soldering bit. The advantage is that such a copper-loaded solder, being

The Efco-Upton submerged graphite electrode salt bath showing (left) the furnace installation and (right) the screw feed device for the electrodes





already saturated with copper, does not attack the soldering bit appreciably. Provided that the temperature of the soldering tip is not excessive, the wear on it is almost negligible.

In practice, it is claimed that the shape of the tip of the soldering bit changes so slowly that it is possible to make from ten to one hundred times as many joints between each reshaping of the tip by grinding. One advantage of this is that it is practicable to form the tip of the soldering bit to any specially suitable shape, as, for example, with a groove in it which will fit over the wire being soldered and thereby transfer heat more quickly and so save time in soldering.

The presence of copper to this extent in the finished joints is claimed to improve the fatigue and the creep strength of joints as compared with joints made with solders which contain no deliberate addition of copper. Resistance to corrosion, particularly of the 60 per cent tin solders such as are necessary for electronic assembly work, is said to be unaffected by the presence of the copper addition.

The idea has been patented and copper-loaded wire solders are now available from licensees in several countries.

Resistance Welding

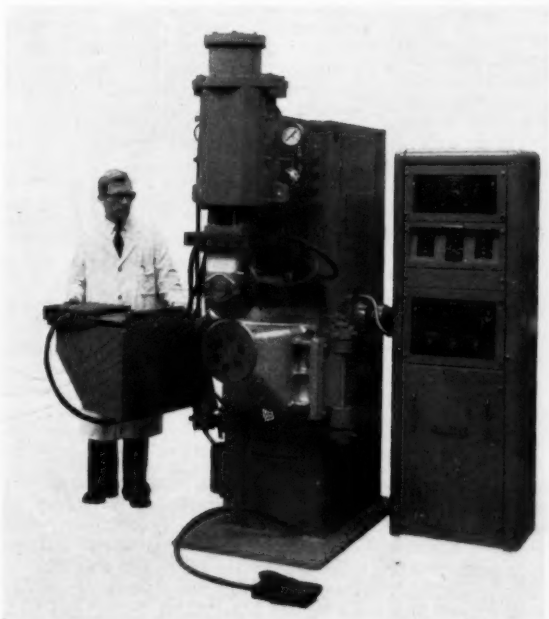
PRIMARILY designed for research work into either spot, seam, roll spot or projection welding, a machine, the UAM.150, has recently been produced by Sciaky Electric Welding Machines Ltd., of Slough, which can be used for production runs if necessary.

To make the machine suitable for practically every kind of metal, the pressure head is pneumatically controlled, and provision is made for one, two or three pressure cycles. A frictionless roller bearing diaphragm head is fitted. The fully electronic Sciaky Control Panel allows for extremely accurate timing control from ½ cycle upwards, phase shift stepless heat control, slope control, and preheat and/or post-heat. Three fully synchronous basic Sciaky Dekatron Timers, plus motor control, give an almost infinite combination of machine settings.

The main frame of the machine is fabricated from heavy gauge steel plate, designed to withstand any stresses likely to be imposed.

Heavy duty spot, projection, seam or roll spot welding may be done on the machine. Two lower arms are supported on pillars, one on each side of the machine. The seam or roll spot arm, when clamped into position, engages with a shaft from the infinitely variable speed motor/brake unit. For spot welding, the tee-slot platen-equipped lower arm is used in conjunction with bolted-on electrode holders. The arm not in use may be swung through approximately 180° to lie along the machine's main frame well clear of the operator.

The Sciaky UAM.150 laboratory welder for spot, seam, roll spot or projection welding



New Testing Equipment for Blowpipes

TO ensure a high standard of efficiency for the Saffire range of oxy-acetylene hand welding and cutting blowpipes, a new flow test instrument has been designed by British Oxygen Gases Limited (Equipment Division). Until recently, blowpipes were flame tested away from the production line, and this procedure was detrimental to good work flow. It was necessary for each blowpipe assembly to be coupled separately to both an oxygen and an acetylene supply. This enabled it to be lit and checked for flame shape to ensure there were no blockages in the gas passages or faulty control valves.

The instrument detects any deficiencies in the equipment by ensuring that the rate of air flow through the assembly is accurately maintained to predetermined specific tolerances.

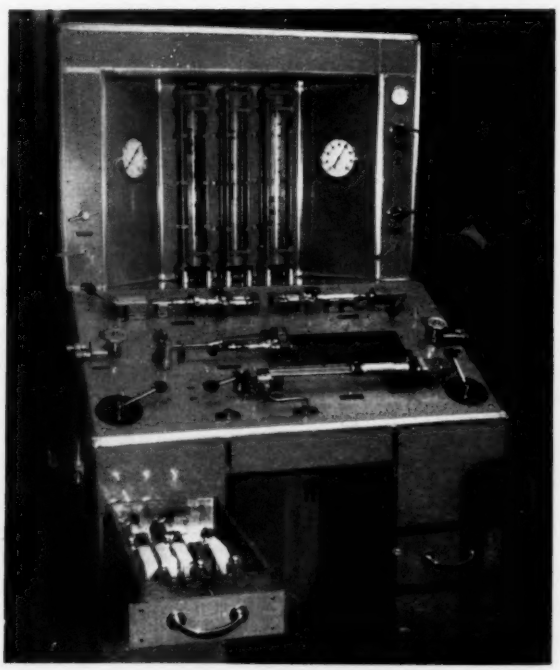
The instrument, a console-type cabinet, has been designed to enable its incorporation as the last operation on the assembly line. A number of quick-release type fixtures are permanently mounted on a sloping panel, and air can be supplied to any of these at the required working pressure by means of two rotary selector valves.

Both high- and low-pressure air systems are incorporated in the instrument, and the reading of both pressures is accomplished by means of gauges. An additional pressure gauge measures the air supply for dusting lines.

Three Rotameters, mounted at eye level, are marked for "Acceptance" or "Rejection" tolerances. Air flowing through the assembly travels via an expansion chamber into the Rotameter, from which the precise rate of flow can be observed.

The incorporation of the new instrument in the production line has resulted in an output increase of 30 per cent/man hr.

The flow-test instrument developed by British Oxygen Gases Ltd. (Equipment Division) for flame tests on blowpipes



CONTRACTS AND NEW DEVELOPMENTS UNDERTAKEN BY B.T.H.

Industrial Electrical Equipment

THROUGHOUT 1957, continued progress in the development of industrial and other electrical equipment is reported by The British Thomson-Houston Co. Ltd., and the year saw a number of important installations undertaken and completed, both here and overseas.

During 1957 the output of rectifiers exceeded that achieved in any previous year, and some of the most interesting installations ever undertaken by B.T.H. were put into service.

In 1956 the largest order ever placed with any British manufacturer for rectifier plant was received. This covered the complete rectifier installation for the first two 850 V, 100,000 amp. pot lines for a new aluminium smelter to be built and operated by the Canadian British Aluminium Co. Ltd. at Baie Comeau, on the north shore of the St. Lawrence River, in Eastern Quebec. Eight rectifier transformers of the sixteen to be supplied have now been commissioned. The transformers, which are rated for a rectifier output of 12,100 kW 850 V D.C., are probably the largest in the world for this duty. The equipment for the first pot line, together with the alternative 33 kV supply busbar system, central control room, and auxiliary services, has now been erected and successfully commissioned. Erection of the rectifier equipment to supply the second 850 V 100,000 amp. pot line is now in progress, and this second stage is expected to go into service in the second half of 1958.

On the Copperbelt in Rhodesia, a 13,000 amp. 150 V unit for the electrolytic refining of copper was commissioned in September. A similar unit, rated 12,000 amp. 150 V, has been despatched and will be commissioned early in 1958.

Orders received during the year for installation in Australia include two 16,000 amp. 100 V units and one 8,000 amp. 130 V unit for copper refining, and four 250 kW 230 V units for general factory supply.

Birlec Ltd., a member of the same group of companies, has developed a packaged induction heating unit in the form of a cubicle for housing all control gear and the recently-designed B.T.H. 20 kW 8·3 kc/s motor-alternator set. These units are proving very popular for diverse industries, and applications include brazing, sintering, heating for upsetting, melting, high frequency research, and experimental tests for technical colleges.

Manufacture is proceeding for Marwin Designs Ltd. on complete sets of electrical equipment for spar milling machines. These are for milling aluminium blocks into contoured sections for forming wing sections of jet aircraft. The main spindle motor which drives the milling cutters consists of two 60 h.p. liquid-cooled stator/rotor units mounted on a common shaft. The drive to the column of the machine, which traverses along a 30 ft. bed, is from a 5 h.p. D.C. "Emotrol"-controlled motor.

In connection with the motor contract for the Mond Nickel Co. Ltd,. the first part of the change-over has been completed with the supply of 910 motors ranging from 1 to 170 h.p. The second part of the change-over and extension are in hand.

Continuous effort has been made throughout the year towards greater standardization of component and sub-assemblies used in B.T.H. industrial electronic apparatus. This has been allied with the setting up of modified methods of handling and processing manufacturing information in anticipation of commencing manufacturing operations at the New Parks Factory, Leicester, in 1958.

Automatic tracer controls commissioned on large machine-tools have exceeded the number of any previous year. B.T.H. 3-D tracer control has been fitted to a number of floor-type milling machines of Giddings and Lewis manufacture, and 2-D tracer control has been applied to a number of boring mills.

The system of automatic co-ordinate setting is proving attractive to machine tool makers. Batch production is proceeding and 25 equipments have been sold.

A new automatic card-reading machine has been developed for use with the automatic co-ordinate setter; card-reading has been greatly speeded up and makes practical the production of irregular forms by a process known as "staircase-milling." The cutting tool is quickly and successively positioned at a sequence of settings determined by a deck of punched cards. This type of control applied to a jig-borer enables the machine-tool to carry out the normal functions of precision jig boring, with automatic settings; and also to function as a numerically controlled form-milling machine having a higher order of accuracy and lower additional cost than any other type of numerical control now on the market.

The B.T.H. Company was the first to introduce controls for resistance welding using an electronic counting tube, i.e. the Dekatron. The latter gives a visual display of duration of weld, etc., as well as being a controlling element in the system. The standard range of welder controls using Dekatron timing was introduced in 1951, and has now been redesigned. The principal feature of the new designs is that the standard cubicles can be provided with control units giving either manual control or automatic control of welding current. Synchronous timing of weld current is provided as before, and weld duration can be controlled in steps of 1 cycle of the 50-cycle supply.

There has been increased use of sequence control of welding, particularly in the motor car industries. Two types of this control are now in production, one a fully synchronous control and the other a somewhat simpler and cheaper non-synchronous unit. Both types provide for "squeeze," "weld," "forge" and "off" preset operating periods.

A further addition to the B.T.H. range of standard electronic welder controls is a heat control unit, which can be added to the standard ignitron contactor.

An ever-increasing variety of semiconductor devices is being progressed to the production lines. Whilst point-contact diodes using germanium metal are still the largest in demand, p-n junction rectifiers have been firmly established in production quantities, and these have recently been designed into bridge units for both single- and three-phase operation. The coming year will see the transfer of silicon junction rectifiers from the advanced development stage, and a comprehensive range of small- and medium-power rectifiers is planned.

A range of industrial-size transistors is also planned to follow the low-power and high-frequency types at present being made. Hermetic sealing of both transistors and rectifiers has been a predominant part of the development work during the year.

Obituary

Mr. J. Austin

IT is with very much regret that we have to announce the death, in his eighty-fourth year, of Mr. James Austin, formerly chairman and managing director of E. Austin and Sons (London) Limited until his retirement last year. Mr. Austin was a member of the National Association of Non-Ferrous Scrap Metal Merchants.

Mr. Fox-Parker

IT is with regret that we also have to record the death, at the age of 45, of Mr. Charles Fox-Parker, sales manager of William Mills Ltd., of Wednesbury. Mr. Fox-Parker was previously with the British Aluminium Company Limited.

Industrial News *Home and Overseas*

Post-Graduate Training

It is announced that the D.S.I.R. will again offer awards this year for post-graduate training in science and technology, and a new edition of "Notes on D.S.I.R. Grants for Graduate Students and Research Workers" has just been published giving full details of the scheme.

Last year, 649 new Research Studentships were awarded by the Department, in addition to those which were renewed for second and third years. Also, 152 of the newly-introduced Advanced Course Studentships were awarded. In all, 1,453 post-graduate studentships were current at the beginning of the present academic year. It is hoped that in this present year the Department will be able to make at least as many new awards as in 1957.

The booklet also explains two other schemes—those for D.S.I.R. Research Fellowships and Grants for Special Researches.

New Provincial Premises

New premises have recently been acquired by **S. N. Bridges and Company Ltd.** at 15 Quay Street, Manchester, 3, where sales and service facilities are available. The new telephone numbers are Deansgate 4928-9.

Telephone Numbers

Formerly, the following three companies of the **Distillers Plastics Group**—British Geon Ltd., British Resin Products Ltd. and Distrene Ltd.—were served at Devonshire House, London, through one central telephone exchange for the building.

It is now announced that separate telephone numbers have been arranged as follows:—for British Geon Ltd., Hyde Park 7321, and for the other two companies Hyde Park 0151. The new arrangements will ensure that all telephone enquiries for these three companies receive direct and immediate attention by the companies' own staffs through the newly-installed exchange.

An Amalgamation

We are informed that the **Electro-Plating Equipment Co. Ltd.** has been amalgamated with **Sonic Engineering and Equipment Ltd** The trade mark "E.P.E.," however, is being retained and the latter company will continue to operate from 120-130 Parchmore Road, Thornton Heath, Surrey.

Residential Course

Advance details are published of the third residential course for **Works and Plant Engineers** organized by the Regional Council for Further Education for the South West, in collaboration with the Somerset Local Education Committee and the National Industrial Fuel Efficiency Service, and which will be held at the Grand Central Hotel, Weston-super-Mare, from March 24 to 29 next. This refresher course has been arranged to provide an opportunity for technical staffs of industrial firms and other large steam users to obtain up-to-date information on recent developments in the efficient use of heat and power. The fee for the whole course, including accommodation and meals, is 12 guineas and complete details and programme may be obtained from the Secretary, Regional Council for Further Education for the South West, at 12 Lower Castle Street, Bristol, 1, not later than February 14 next.

Quality Control

A course on Case Studies in Quality Control, commencing on February 4 next, is being offered by the Production Engineering Department of the College of Technology, Birmingham. This course, which consists of eight weekly lectures by specialists from various branches of industry, is designed for personnel whose responsibility is the quality function within their own works and would, therefore, already possess some knowledge of the fundamentals of inspection and the control of quality.

Complete details may be obtained from the College of Technology, Suffolk Street, Birmingham, 1.

Metals in Soviet Russia

Important deposits of non-ferrous metals have been discovered in the Carpathian area of the Ukraine, in the districts of Lvov, Rovno and Tarnopol (formerly Eastern Poland), the Industrial and Economic Gazette reports. They are said to include mercury, tin and zinc ores.

Japan's Copper Output

It has been announced in Tokyo by the Japan Mining Association that the production of electrolytic copper in the country during 1957 amounted to 142,171 tons, which was a post-war high. The figures include the amount produced for foreign users from ore supplied by them. Output in 1956 was 126,156 tons.

The Association said the increase in production reflected the expansion of mill capacity, which had more than offset the decline in output recorded since last October.

Smelters' stocks of electrolytic copper were estimated at 17,000 tons as at the end of December, while electrolytic copper production in December totalled 11,828 tons, compared with 11,944 tons in the preceding month.

Chemical Engineering

Details of the programmes of the congresses and meetings organized by DECHEMA, and to be held in Brussels and Frankfurt (Main) this year, have now been issued. These programmes may be obtained on application to DECHEMA, Deutsche Gesellschaft für chemisches Apparatewesen, Frankfurt (Main) 7, Rheingau-Allee 25.

Welding News

During his recent visit to the Wallsend shipyard of Swan Hunter and Wigham Richardson Ltd., H.R.H. the Duke of Edinburgh saw demonstrations of some of the new machinery which has been designed to speed up ship production. Among the machines he saw was a welding gantry with a 60 ft. span, which is used for the automatic butt welding of the edges of bulkhead plates. It is said that this is the first machine of its kind to go into service in this country. It was designed and installed by **Quasi-Arc Ltd.**, and it is understood that a number of similar machines will be supplied to other firms in the course of the coming year.

The Duke also saw another gantry installation designed to make simultaneous fillet welds on either side of bulkhead stiffeners. This machine carries two automatic welding heads, two powder recovery and re-circulation units and two welding power supply units. Guide wheels riding on the stiffeners and bulkheads ensure that the welding heads follow the seam correctly. This gantry was also designed and manufactured by Quasi-Arc Ltd.

Fire Prevention

A new system of controlling outbreaks of fire in factories by means of fire venting has recently been developed by **Colt Ventilation Ltd.** In view of many requests for complete information regarding this system, Mr. M. J. Reaney, director and general manager of the company, is to give talks, illustrated by a sound film, at a number of provincial centres.

The first of these talks was given in Sheffield last week and the second is to be given on Wednesday next, January 29, at the Queen's Hotel, Birmingham, at 5 p.m. Two more talks are to be given as follows:—at the Adelphi Hotel, Liverpool, on February 13, and at the Liverpool College of Building on March 13. Other lectures will be given later in Bristol and Glasgow. At these lectures, Mr. Reaney will explain how the need for fire venting became apparent, and how venting a fire will help extinguish it. The film which is being shown to accompany the talks has been made by the Colt Film Unit. It can be obtained on loan from the company on application to The Film Librarian, Colt Ventilation Ltd., Surbiton, Surrey.

A Wolverhampton Lecture

Following a lecture by Dr. J. G. Powell, of the Technical Service Laboratories of the **Shell Chemical Company Limited,** students at the National Foundry College, Wolverhampton, were able to examine, on a demonstration bench, the samples, equipment and materials provided by the lecturer in his address on the use of "Epikote" resins in the manufacture of foundry patterns. During the course of his lecture Dr. Powell demonstrated the techniques of mixing and pouring resin foundry patterns.

Scottish Sales Office

In order to provide increased sales service for their "Gyraflo" centrifugal fans, "Midac" dust, fume control equipment and "Aquamiser" water cooling towers, the **Midland Heating and Ventilation Company Ltd.,** of Birmingham, have appointed Mr. Vincent Flynn as their Scottish sales engineer. He will operate from 16 Egilsay Crescent, Glasgow, N.2, with the telephone number of Bishopbriggs 2667.

New Publication

From the **Copper Development Association** has come a new magazine introduced under the title of "Copper." This first issue is of 24 pages, with four-colour

printing on the covers. It is essentially a technical illustrated journal, with articles on a wide range of subjects which should appeal to all interested in copper and its alloys.

A foreword, written by the chairman of the C.D.A., Sir Ronald Prain, O.B.E., says that the magazine will convey to readers some features of the work of the association and of new developments to industry.

Australian Tin Prospects

From Darwin it is reported that Mr. Frank Jones, general manager of United Uranium, recently stated that the Maranboy tinfield, near Katherine, in the Northern Territory of Australia could become Australia's largest producer of tin. He said mining engineers believed the field could provide Australia's tin needs for years to come. If successful, it could produce up to 500 tons of tin ore daily. United Uranium, King Island Scheelite and Lolona Gold Mines of New Guinea have joined in a prospecting venture on the field, having obtained prospecting rights.

News from Birmingham

The non-ferrous metal industries in the Midland area maintain a good volume of business. Although the year has opened quietly as far as new business is concerned, the outlook is regarded as satisfactory. The dispute in the cycle trade has been settled but there is still trouble in the motor trade over wage rates, and this is slowing down production in some factories. The falling-off in business in the building trade is causing some concern. The slackness is more marked than usual at this time of the year and it is attributed to the financial restrictions. As a result, there is less business in castings and pressings used in the trade.

Imports of iron and steel continue to decline as the result of larger deliveries of most products from British works, but the drop in the buying of foreign billets has also been brought about by a falling-off in orders at the re-rolling mills. The heavy engineering industries are busy. New contracts have come in recently for electric equipment for power stations in India. The rolling stock works are likely to be busy for a very long time ahead on orders for both overseas and home railways. Substantial quantities of steel are needed for production in coal mining machinery.

Legal Knowledge

A course on Industrial and Factory Law has been arranged by the Industrial Welfare Society (Inc.) to be held at Robert Hyde House, 48 Bryanston Square, London, W.1, on February 4 to 6 next. This course covers, in a short period of three days, the whole of the legal ground work necessary to industrial managers and executives. It is being constantly brought up to date and, therefore, serves also as a refresher course for those who have not attended a lecture on this subject for some time. Full opportunity is given to the consideration of individual problems affecting firms taking part.

The fee for delegates from member firms is six guineas and for non-members seven guineas. This includes morning and afternoon tea, but delegates are free to make their own arrangements for lunch, which is not included. The commencing and finishing time is arranged especially to suit the convenience of members from outside London. Full details of this course and a list of nearby hotels will be sent on application to the secretary of the Society at Robert Hyde House.

Lead and Zinc in Germany

West German lead and zinc ore producers hope that a long-term credit to be guaranteed by the West German Government will help them to overcome present price difficulties and to prevent drastic cuts in production, a spokesman for one of the prominent zinc and lead ore mining companies has stated.

The credit plan, which is now being discussed between representatives of the mining companies, Government officials and bank authorities, provides that the money be made available by the Reconstruction Loan Corporation at Frankfurt. However, size and terms of the credit have not yet been fixed, according to the spokesman. It is also possible that some other kind of financial help may be arranged.

The reason for the difficulties in the lead and zinc mining industry was that prices for both zinc and lead fell by almost 40 per cent last year, thus seriously affecting the economics of the industry. The West German mine production of lead in 1956 was 66,200 tons (in terms of recoverable lead) and that of zinc was 121,800 tons (in terms of recoverable zinc). These quantities covered about 37 per cent of West Germany's requirements for lead and 42·7 per cent of her requirements for zinc.

Aluminium in Spain

News from Vigo is that the Minister of Commerce and Industry has authorized the construction of an aluminium plant in that city. When in operation, this new plant is expected to produce 10,000 tons of aluminium during the first year and then 20,000 tons annually.

Mineral Processing

Preliminary notice is given of an International Congress on Mineral Processing which is being organized by the **Institution of Mining and Metallurgy** and will be held in London from April 6 to 9 in 1960. It is proposed that the Papers to be discussed should cover fundamental and applied research and development in the fields of mineral dressing, chemical processing, roasting, cyanidation, leaching and solvent extraction, but not smelting. Enquiries relating to this event should be addressed to the secretary of the Institution at 44 Portland Place, London, W.1.

A Bristol Event

Notices have been issued relating to the annual dinner and dance of the Bristol and South West branch of the **Institute of Metal Finishing**. This function is to be held on Thursday, February 20 next, at the Royal Hotel, College Green, Bristol, 1, at 7 p.m. Applications for tickets (price £1 7s. 0d. each) should be made to the hon. treasurer of the branch at 10 Tower Hill, Bristol, 2.

Trade with Belgium

Rapid expansion of the company's activities overseas has made it necessary for **Evershed and Vignoles Ltd.** to open a branch office in Belgium. This office, which is situated at Succursale, 142 Rue Gallait, Bruxelles, will be opened on April 1 this year and will be under the management of Mr. C. Samyn, who has for a number of years handled the company's products in Belgium.

Agency Agreement

It has been announced by **Durham Raw Materials Limited** that they have been appointed distributors in the United Kingdom of materials manufactured by the J. M. Huber Corporation, of New York. In addition to their carbon blacks, these materials include Zeolex (an aluminium-silicate reinforcing agent), Turgum S, Butac, and Nutac, which are rubber rosins with specific uses; Actone, an activator/accelerator, and a range of hard clays.

U.K. Metal Stocks

Stocks of refined tin in London Metal Exchange official warehouses at the end of last week totalled 14,909 tons, comprising London 4,881; Liverpool 9,208; and Hull 820 tons. Copper stocks totalled 19,654 tons, and comprised London 11,296; Liverpool 6,308; Birmingham 1,350; Manchester 25; Swansea 429; and Hull 250 tons.

Aluminium Plant in Norway

It is anticipated that the new aluminium plant at Mosjoen, in Norway, built by Elektrokjemisk A/S, will go into production in the near future, possibly before the end of January. The managing director of Elektrokjemisk has disclosed that the greater part of the company's output for the next few years has already been sold. In certain production lines, the output for the next ten years had been sold, he said.

New Laboratories

On Monday last, Mr. Harold J. Cotes, chairman and managing director of **British Glues and Chemicals Ltd**, opened the group's new laboratories at Bermondsey, London, S.E. These laboratories are an extension of those already in use by the research and development departments, and also include the recently-formed biochemical research department.

Furniture on Show

Opened on Wednesday last, the Furniture Exhibition at Earls Court, London, contains many interesting exhibits of domestic and other furniture in which light metals are used in various forms for construction purposes. In addition to the public section of the exhibition there is also a trade section, in which such firms as The Kaymet Company (showing anodized ware), Woodmet Ltd. (aluminium ware) and Metchair Ltd. (metal furniture) are showing their products. The trade section remains open until January 30, while the public section is open until February 1.

Bearing Lubrication

Some time ago, **Rocol Ltd.** introduced a combination of bentine grease and molybdenum disulphide known as "Molytone Grease" for bearing lubrication. From the first of next month, however, this trade name will stand for three greases developed and marketed for the first time—"Molytone 265 Grease," "Molytone 320 Grease," and "Molytone 380 Grease."

The first-named now replaces the

original grease of 250-280 penetration. It is stated to be suitable for general grease cups, ball and roller bearings of over 2 in. diameter and of speeds up to 2,000 r.p.m. Penetration: 265-280.

"Molytone 320 Grease" has been specially developed for pressure systems, automatic lubricators, and ball and roller bearings of under 2 in. diameter and working at a speed of over 2,000 r.p.m. The penetration range is 310-330. The third-named grease is an ultra-soft grease for high speeds of over 10,000 r.p.m., precision work, instruments, servo motors, gyros and all lightly powered mechanisms. The penetration is 370-390. These new greases are supplied at the same prices as the former single product.

A New Company

Notice has been issued by the **International Refining Co. Ltd.** to the effect that they have formed a new company, to be known as **Non-Ferrous Stockholders Ltd.**, occupying warehouses at 20-22 Sugar House Lane, London, E.15. The main function of this new company will be the distribution and the merchanting of semi-manufactured goods (sheets, rods, sections, strip, wire, etc.) of aluminium and its alloys, and of copper, brass and steel and their alloys, as well as the purchase and clearance of works arisings of such materials.

It is understood that Mr. R. A. Allan, formerly of the Alreco Metal Co. Ltd. and the Atlantic Metal Co. Ltd., has been appointed a director of the new company.

Storage Bin

It is announced by **Precision Components (Barnet) Ltd.** that they have made the addition of Storage Bin T.B.250, moulded in natural colour polythene (semi-transparent white) to their range of "Kabi" bench assembly trays and storage bins. Primarily designed for the handling and storage of materials and components in the engineering and allied industries, these containers in the new material can be used for many other purposes in various industries.

A New Club

An interesting function took place yesterday (Thursday) evening in the main canteen at the head office of **W. Canning and Company Ltd.** in Birmingham, when the "Canning '20' Club" was inaugurated. Qualification for membership of this club is to have achieved 20 years' or more service with the company.

At this inaugural dinner nearly 260 employees and ex-employees of the company were present. Silver badges were issued to mark the formation of the club, and it is interesting to note that the combined service of those attending the function was in the order of 8,000 years and out of a current total of approximately 2,000 employees 12½ per cent have been with the company for 20 years or longer. Sir Ernest Canning, chairman of the company and President of the club, was in the chair at this function.

Mond Nickel Fellowships

Applications for the award of the Mond Nickel Fellowships for 1958 are now invited. The main object of these Fellowships is to enable selected applicants of British nationality and educated to University degree or equivalent standard to obtain additional training and wider experience in industrial establishments at home or abroad, so that, if they are subsequently employed in executive or administrative positions in the British metallurgical industries, they will be better qualified to appreciate the technological significance of research and to apply its results.

There are no age limits, though awards will seldom be made to persons over 35 years of age. Each Fellowship will occupy one full working year. It is hoped to award five Fellowships each year of an approximate value of £900 to £1,200 each. Applicants will be required to define the programme of training in respect of which they are applying for an award, as well as particulars of their education, qualifications and previous career.

Full particulars and forms of application may be obtained from The Secretary, Mond Nickel Fellowships Committee, 4 Grosvenor Gardens, London, S.W.1. Completed application forms will be required to reach the secretary not later than June 1 this year.

Compressed Air Regulations

On Wednesday of this week the Minister of Labour and National Service published Regulations which require special measures to be taken to protect the health and safety of men employed on work in compressed air. The Regulations were laid before Parliament on the same day and will come into operation on April 21 this year.

These Regulations were discussed in detail with interested organizations before they were published as a draft in August of last year. A number of observations were received on the published draft, but all outstanding points have now been resolved. The new Regulations are designed to ensure that close attention is paid to the health and safety of those working in compressed air and, in particular, that correct control and supervision is exercised over procedures, both in compression and decompression. Detailed rules for these procedures are contained in a schedule to the Regulations.

Soviet Asian Plants

According to news from Moscow, a large Soviet non-ferrous metal industry will soon be set up in the Soviet Pacific area, based mainly on Komsomolsk, on the Amur. Development of this industry has been hampered so far by the lack of electric power for smelters, but as the new Siberian power stations are completed it will no longer be necessary to transport ore to smelting plants which are often 1,000 miles from the mines.

Export Trade

United Kingdom Trade Commissioners and Commercial Diplomatic Officers are expected to be in this country on leave during February-March this year as follows:—From Pakistan, Mr. F. F. D. Ward, M.B.E.; from West Indies, Mr. D. Broad; from Brazil, Mr. J. P. Summerscale, C.B.E.; and from Japan, Mr. D. J. Cheke.

United Kingdom firms who wish to meet any of these officers to discuss specific export problems are asked to apply for an appointment to the Board of Trade (Tours Section), Horse Guards Avenue, London, S.W.1. Every effort will be made to enable interested firms to meet officers in London and in selected centres in the provinces, but prior departmental commitments and private leave arrangements may make it difficult to meet all applications on this occasion.

Firms are reminded that the Export Services Branch of the Board of Trade, Lacon House, Theobalds Road, London, W.C.1, are in close touch with all overseas representatives and would be glad to advise United Kingdom firms on matters relating to their export trade. Regional Officers of the Board of Trade are also available for consultation on export matters.

Prospecting in Hungary

The Hungarian search for metallic ores is meeting with considerable success, Mr. Balin Papp, the Director of the Ministry for Heavy Industry, has declared, according to reports reaching Vienna. He said that the results of the search in the Matra Mountains for gold, silver, lead, zinc and copper ores were "promising." He added that lead and zinc ores were being sought in the Velencei Mountains, iron ore between Rudabanya and Kelecseny, and manganese in the areas around Urkut and Epleny.

Magnetic Separation

A useful leaflet has been issued by **Davies Magnet Works Ltd.**, of Ware, drawing attention to their model 51 magnetic separator, which is a compact, high-capacity unit which meets the demand for large tonnage throughput with peak quality products. Another leaflet describes and illustrates Model No. 1 Premier concentrating table, which occupies a floor area of 9 ft. by 3 ft., coupled with a nett weight as low as 476 lb.

Forthcoming Meetings

January 29—Institute of British Foundrymen. London Branch. Constitutional Club, Northumberland Ave., London, W.C.2. Apprentices' Evening: Consideration of "Sticky Problems." Compered by A. Talbot. 7.30 p.m.

January 29 — Manchester Metallurgical Society. Manchester Room, The Central Library, Manchester. "The Behaviour of Metals at High Temperatures." N. P. Allen. 6.30 p.m.

January 31 — Non-Destructive Testing Society of Great Britain. London Branch, 32 Welbeck Street, London, W.1. "Ultrasonics for Non-Destructive Testing." H. W. Taylor. 7 p.m.

January 31 — Institution of Production Engineers. Northern Region. The Neville Hall, Newcastle upon Tyne. "Technical Training and Professional Status." The Rt. Hon. The Earl of Halsbury. 7 p.m.

January 31—Institute of Metal Finishing. Sheffield and North East Branch. The Grand Hotel, Fitzwilliam Room, Sheffield. "Growth of Electrodeposits" —Film. Commentator, J. Wilcock. 7 p.m.

January 31 — Incorporated Plant Engineers. Birmingham Branch. The Imperial Hotel, Temple Street, Birmingham. "Trade Effluent Treatment." J. Lakin. 7.30 p.m.

Metal Market News

THE British Bureau of Non-Ferrous Metal Statistics has issued details of consumption and stocks for the month of November showing that this month was hardly up to its predecessor, although the decline in zinc stocks was really negligible. Consumption of refined copper at 44,144 tons fell by about 5,500 tons, but scrap at 11,464 tons was 1,050 tons up. Stocks of both blister and refined declined, the total coming down from 90,877 tons to 81,657 tons. In lead, stocks of imported virgin and English refined, at 48,065 tons, compared with 50,371 tons at October 31, while consumption, including scrap and remelted lead, at 31,060 tons was 1,471 tons lower. In zinc, the decline in stocks was only 200 tons, but consumption, including secondary material, fell to 26,705 tons, a drop of 2,747 tons. Usage of tin in November, at 1,615 tons, was 332 tons below October and compared with the monthly average January - September of 1,867 tons. Stocks were up to 10,591 tons, against 6,045 tons at October 31, and have, of course, increased considerably since. Figures published by the American Zinc Institute show that, in terms of short tons, stocks at December 31 were 166,655 tons, against 152,513 tons a month earlier. Production in December was 86,270 tons, compared with 79,754 tons in November.

When it was known on Monday last week that there was a virtual certainty that both Chile and the Belgian Congo would reduce production by 10 per cent, the market rallied, but in such a half-hearted fashion that the net gain was only about 30s. per ton. The fact is that the week-end news was generally so indifferent that the consensus of opinion was that but for the news of the output cuts the market would have been quite a bit lower. The reduction in annual output as a result of this action by the two countries should amount to something like 65,000 tons, which is certainly a sizeable contribution to eliminating the present excess of supply over demand. Hard on the heels of this announcement, however, came news that Kennecott had reduced its price to 25 cents, a lead quickly followed by Phelps Dodge and Anaconda. At the same time, the custom smelters cut their quotation by 50 points to 24½ cents. Point is certainly given to the output cuts by the December statistics issued by the Copper Institute. These are as follow, in short tons of 2,000 lb. Inside the U.S.A. production of crude copper was up by about 4,170 tons at 102,523 tons, while refined output went up by 8,000 tons to 136,135 tons. Deliveries of refined copper to consumers dropped by 20,000 tons to 80,641 tons, while stocks advanced from 161,500 at November 30 to 181,024 at December 31. Outside the U.S.A., crude production, at 152,303 tons, was more than 11,000 tons below the November figure of 164,299 tons, while at 128,137 tons refined output was down by nearly 2,000 tons. Deliveries to consumers dropped by nearly 10,000 tons to 137,706 tons, while stocks were fully 12,000 tons up at 277,316 tons.

At the beginning of last week, L.M.E. warehouse stocks of copper were once again reported lower, this time by 150 tons to 19,904 tons, while in tin there was a sharp increase of 1,594 tons to 14,795 tons. All through the week, the copper market lost ground, finally, after a turnover of 9,000 tons, closing at the lowest point reached, viz £171 15s. 0d. for cash and £174 15s. 0d. three months. On balance, therefore, both positions lost £4 15s. 0d., which, in view of the price reductions in the States, was probably not too bad. There is undoubtedly some resistance to a further fall at this level, for it must be admitted that there is very little prospect of any improvement in values. Both lead and zinc developed fresh weakness, the former losing 30s. and 27s. 6d. for the respective positions and the latter £2 and £1 15s. 0d. Tin, however, was really very weak, for the three months' price had dropped to £705 by Friday afternoon, a loss of £27 10s. 0d. on the week. Renewed fears about the ability of the Tin Council to continue its support appeared to be the reason for this severe setback. A meeting of the Council is scheduled to be held this week and, pending some pronouncement, the course of tin prices is likely to be erratic.

New York

The U.S. copper price last week dropped to the lowest level in five years. Kennecott Copper Corporation cut its U.S. price by two cents a lb. to 25 cents. Phelps Dodge and Anaconda, the other two leading U.S. producers, followed the decline. Custom smelters, aware of the intensified competition from the producers, reduced their price by one-half cent to 24½ cents per lb. Traders said continued slow fabricator interest and excess accumulation of copper on a world-wide basis were leading factors in the copper cut.

Leading copper producers said the Chilean announcement of a projected 10 per cent cut in output was vague and implied that cutbacks in other areas would be necessary before the Chilean announcement was implemented. Meanwhile, these sources noted that there had been no announcement so far from the Anglo-American group in Africa along these lines, while the Union Miniere's cutback plans were "cloudy." They added that at the back of the two years' slump in the price of copper from its record high levels was a greatly increased productive capacity that had been accompanied by a drop in consumer demand, principally in the U.S. Although there had been substantial cutbacks in the U.S. in mine output, this had failed to check the slump in demand from U.S. industry. The trade sources said that foreign producers had been much slower in cutting output, and so far only a few had announced cutbacks.

Brass and wire mills also announced price cuts in proportion to the copper content of the goods.

Lead and zinc were generally quiet, with intense foreign competition making difficult conditions for domestic. Both foreign lead and zinc are being offered in the U.S. at about one cent under the domestic metal. Trade sources said foreign supplies of the two metals were expected to rise as the overseas producers accelerated deliveries to beat the Tariff Commission's expected high tariff recommendation to the Administration. Industry sources noted that it could well be another few months before such higher duties put forward by the Commission were ultimately approved by President Eisenhower.

Tin moved irregularly over the week with fluctuations in foreign centres the main price factor in the U.S. Modest dealer and small to medium consumer buying was reported. But large consumers were inactive.

Scrap copper softened further this week on the market, reflecting the decline on the London Metal Exchange and a half-cent drop in custom smelter price to 25 cents.

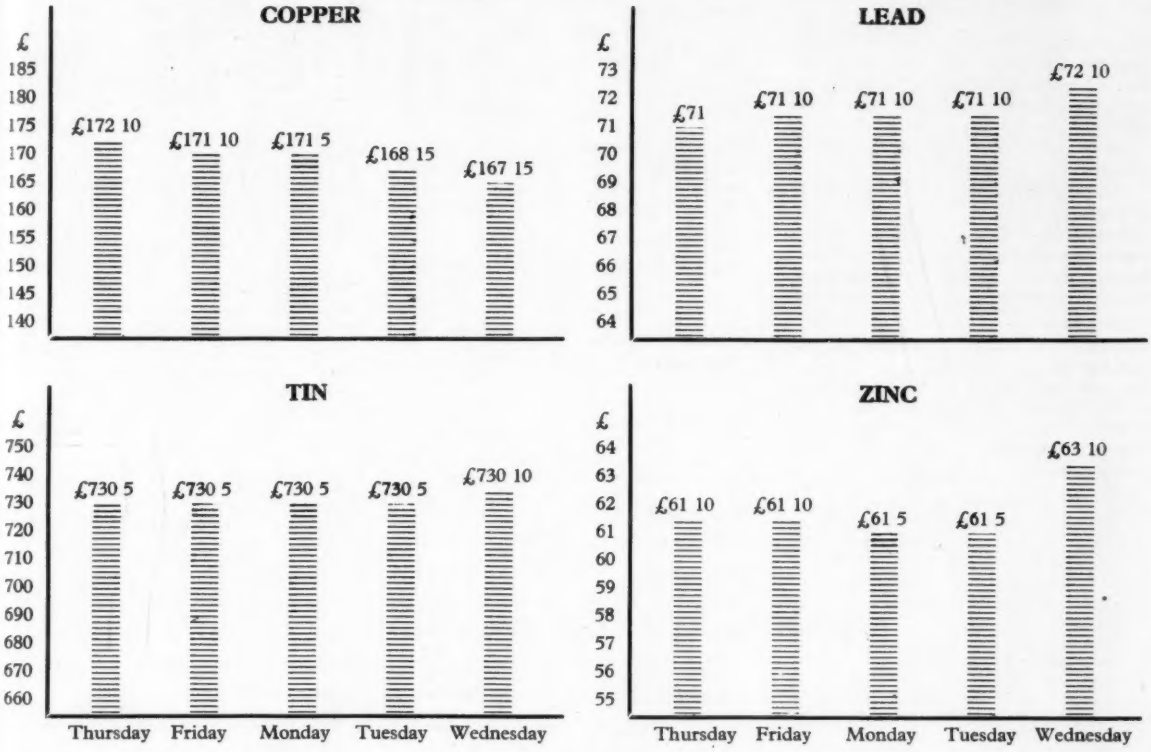
Paris

Copper, zinc and lead half-finished products have all gone up in price under a new Order. At the moment of writing, laminated zinc and lead tubing remain unchanged, but copper wire, tubes and bars have all increased from 2·50 per cent to 6·70 per cent, according to the product. Copper ingots have also undergone a price increase to 235 francs per kilo.

The price increase was, of course expected. The Government now intends to stabilize prices and will do its utmost to avoid further price changes. Metal and other circles believe that a further devaluation of the franc is inevitable. There is not much faith in the Government's objectives. One reason is the start of the Common Market. High social charges in France place industry on unequal terms. A conference on these charges, in order to iron out inequalities, has been asked for by France but, it is said, Germany has received it coldly. A realistic rate of exchange is, in the opinion of the Germans, the only way for France to become competitive. Further price increases during the year and possible devaluation are, therefore, expected.

METAL PRICE CHANGES

LONDON METAL EXCHANGE, Thursday 16 January 1958 to Wednesday 22 January 1958



OVERSEAS PRICES

Latest available quotations for non-ferrous metals with approximate sterling equivalents based on current exchange rates

	Belgium fr/kg ≏ £/ton		Canada c/lb ≏ £/ton		France fr/kg ≏ £/ton		Italy lire/kg ≏ £/ton		Switzerland fr/kg ≏ £/ton		United States c/lb ≏ £/ton	
Aluminium			24.63	203 10	198	172 5 0	400	232 0	2.50	209 0	28.10	224 17 6
Antimony 99.0					195	169 12 6	430	249 10			33.00	264 0
Cadmium					1,400	1,218 0	2,800	1,624 0			155.00	1,240 0
Copper												
Crude												
Wire bars 99.9							350	203 0				
Electrolytic	25.00	182 15	24.75	202 10	226	196 12 6			2.25	188 2 6	25.00	200 0
Lead			12.25	101 2 6	123	107 0	185	107 7 6	.92	77 0	13.00	104 0
Magnesium												
Nickel			71.50	590 10	1,060	922 5	1,330	771 10	8.10	677 2 6	74.00	592 0
Tin	100.50	734 12 6			890	774 7 6	1,420	823 12 6	9.00	752 6	91.25	730 0
Zinc												
Prime western			10.00	82 12 6							10.00	80 0
High grade 99.95			10.60	87 10 0								
High grade 99.99			11.00	90 5								
Thermic					107.12	93 2 6						
Electrolytic					115.12	100 2 6	157	91 0	.87	72 15	11.75	94 0

NON-FERROUS METAL PRICES

(All prices quoted are those available at 12 noon 22/1/58)

PRIMARY METALS

		£	s.	d.
Aluminium Ingots	ton	197	0	0
Antimony 99·6%	,,	197	0	0
Antimony Metal 99%	,,	190	0	0
Antimony Oxide	,,	180	0	0
Antimony Sulphide Lump	,,	190	0	0
Antimony Sulphide Black Powder	,,	205	0	0
Arsenic	,,	400	0	0
Bismuth 99·95%	lb.		16	0
Cadmium 99·9%	,,		10	0
Calcium	,,	2	0	0
Cerium 99%	,,	13	18	0
Chromium	,,		6	11
Cobalt	,,		16	0
Columbite	per unit		—	
Copper H.C. Electro	ton	167	15	0
Fire Refined 99·70%	,,	166	0	0
Fire Refined 99·50%	,,	165	0	0
Copper Sulphate	,,	67	0	0
Germanium	grm.		3	4
Gold	oz.	12	8	9½
Indium	,,		10	0
Iridium	,,	27	0	0
Lanthanum	grm.		15	0
Lead English	ton	72	10	0
Magnesium Ingots	lb.		2	5½
Notched Bar	,,		2	10½
Powder Grade 4	,,		6	3
Alloy Ingot, A8 or AZ91	,,		2	8
Manganese Metal	ton	300	0	0
Mercury	flask	73	0	0
Molybdenum	lb.	1	10	0
Nickel	ton	600	0	0
F. Shot	lb.		5	5
F. Ingot	,,		5	6
Osmium	oz.		nom.	
Osmiridium	,,		nom.	
Palladium	,,	7	10	0
Platinum	,,	28	10	0
Rhodium	,,	40	0	0
Ruthenium	,,	16	0	0
Selenium	lb.		nom.	
Silicon 98%	ton		nom.	
Silver Spot Bars	oz.		6	5
Tellurium	lb.		15	0
Tin	ton	730	10	0
Titanium	lb.		19	6
***Zinc**				
Electrolytic	ton		—	
Min 99·99%	,,		—	
Virgin Min 98%	,,	63	3	1½
Dust 95/97%	,,	104	0	0
Dust 98/99%	,,	110	0	0
Granulated 99+%	,,	88	3	1½
Granulated 99·99+%	,,	104	7	6

**Duty and Carriage to customers' works for buyers' account.*

INGOT METALS

†**Aluminium Alloy**		£	s.	d.
B.S. 1490 L.M.1	ton	154	10	0
B.S. 1490 L.M.2	,,	158	10	0
B.S. 1490 L.M.4	,,	182	0	0
B.S. 1490 L.M.6	,,	204	10	0

†Average selling prices for November.

***Aluminium Bronze**				
BSS 1400 AB.1	ton		—	
BSS 1400 AB.2	,,		—	
***Brass**				
BSS 1400-B3 65/35	,,	131	0	0
BSS 249	,,		—	
BSS 1400-B6 85/15	,,		—	

		£	s.	d.
***Gunmetal**				
R.C.H. 3/4%	ton		—	
(85/5/5/5)	,,	161	0	0
(86/7/5/2)	,,	171	0	0
(88/10/2/1)	,,	217	0	0
(88/10/2/½)	,,	228	0	0
Manganese Bronze				
BSS 1400 HTB1	,,	176	0	0
BSS 1400 HTB2	,,		—	
BSS 1400 HTB3	,,		—	
Nickel Silver				
Casting Quality 12%	,,		nom.	
,, ,, 16%	,,		nom.	
,, ,, 18%	,,		nom.	
***Phosphor Bronze**				
2B8 guaranteed A.I.D. released	,,		—	
Phosphor Copper				
10%	,,	208	0	0
15%	,,	216	0	0

**Average prices for the last week-end.*

Phosphor Tin				
5%	ton		—	
Silicon Bronze				
BSS 1400-SB1	,,		—	
Solder, soft, BSS 219				
Grade C Tinmans	,,	344	6	0
Grade D Plumbers	,,	278	6	0
Grade M	,,	377	6	0
Solder, Brazing, BSS 1845				
Type 8 (Granulated)	lb.		—	
Type 9 ,,	,,		—	
Zinc Alloys				
Mazak III	ton	97	12	6
Mazak V	,,	101	12	6
Kayem	,,	107	12	6
Kayem II	,,	113	12	6
Sodium-Zinc	lb.		2	5

SEMI-FABRICATED PRODUCTS

Prices of all semi-fabricated products vary according to dimensions and quantities. The following are the basis prices for certain specific products.

Aluminium			£	s.	d.
Sheet 10	S.W.G.	lb.		2	9
Sheet 18	S.W.G.	,,		2	11
Sheet 24	S.W.G.	,,		3	2
Strip 10	S.W.G.	,,		2	9
Strip 18	S.W.G.	,,		2	10
Strip 24	S.W.G.	,,		2	11½
Circles 22	S.W.G.	,,		3	3
Circles 18	S.W.G.	,,		3	2
Circles 12	S.W.G.	,,		3	1
Plate as rolled		,,		2	8½
Sections		,,		3	2½
Wire 10 S.W.G.		,,		3	0
Tubes 1 in. o.d. 16 S.W.G.		,,		4	1
Aluminium Alloys					
BS1470. HS10W.					
Sheet 10	S.W.G.	,,		3	1½
Sheet 18	S.W.G.	,,		3	4
Sheet 24	S.W.G.	,,		3	11½
Strip 10	S.W.G.	,,		3	1½
Strip 18	S.W.G.	,,		3	3
Strip 24	S.W.G.	,,		3	11
BS1477 HP30M.					
Plate as rolled				2	11½

Aluminium Alloys—*cont.*		£	s.	d.
BS1470. HC15WP.				
Sheet 10 S.W.G.	lb.		3	9½
Sheet 18 S.W.G.	,,		4	1½
Sheet 24 S.W.G.	,,		4	11½
Strip 10 S.W.G.	,,		3	10½
Strip 18 S.W.G.	,,		4	1½
Strip 24 S.W.G.	,,		4	9
BS1477. HPC15WP.				
Plate heat treated	,,		3	6½
BS1475. HG10W.				
Wire 10 S.W.G.	,,		3	10½
BS1471. HT10WP				
Tubes 1 in. o.d. 16 S.W.G.	,,		5	0
BS1476. HE10WP.				
Sections	,,		3	2
Beryllium Copper				
Strip	,,	1	4	11
Rod	,,	1	1	6
Wire	,,	1	4	9
Brass Tubes	,,		1	5
Brazed Tubes	,,		—	
Drawn Strip Sections	,,		—	
Sheet	ton		—	
Strip	,,	205	15	0
Extruded Bar	lb.		1	7⅝
Extruded Bar (Pure Metal Basis)	,,		—	
Condenser Plate (Yellow Metal)	ton	144	0	0
Condenser Plate (Naval Brass)	,,	155	0	0
Wire	lb.		2	2⅜
Bronze Sheet and Strip	ton		—	
Copper Tubes	lb.		1	8½
Sheet	ton	196	0	0
Strip	,,	196	0	0
Plain Plates	,,		—	
Locomotive Rods	,,		—	
H.C. Wire	,,	221	5	0
Cupro Nickel				
Tubes 70/30	lb.		3	2
Lead Pipes (London)	ton	115	5	0
Sheets (London)	,,	113	0	0
Tellurium Lead	,,	£6 extra		
Nickel Silver				
Rods	lb.		—	
Sheet and Strip 7%	,,		3	2¾
Wire 10%	,,		3	9½
Phosphor Bronze				
Wire	,,		3	5⅜
Titanium				
Billet	lb.	4	10	0
Sheet	,,	6	12	0
Wire	,,	9	10	0
Tube	,,	16	0	0
Zinc Sheets, English destinations	ton	95	5	0
Strip	,,		nom.	

LATE NEWS

London.—It has been reported from Amsterdam that Surinam Bauxite, a subsidiary of the Aluminum Company of America, is to cut production by 12 per cent as a result of the parent company's reduced activities.

Financial News

Metal Statistics

Detailed figures of the consumption and output of non-ferrous metals for the month of Nov., 1957, have been issued by the British Bureau of Non-Ferrous Metal Statistics, as follow in long tons:—

COPPER	Gross Weight	Copper Content
Wire	24,047	23,639
Rods, bars and sections	12,552	8,202
Sheet, strips and plate	12,632	10,108
Tubes	7,201	6,678
Castings and miscellaneous	7,566	—
Sulphate	3,191	—
	67,189	55,608
Of which:		
Consumption of Virgin Copper		44,144
Consumption of Copper and Alloy Scrap (Copper Content)		11,464

ZINC	
Galvanizing	7,759
Brass	8,517
Rolled Zinc	1,951
Zinc Oxide	2,421
Zinc Die-casting alloy	4,153
Zinc Dust	883
Miscellaneous Uses	991
Total, All Trades	26,705
Of which:	
High purity 99·99 per cent	4,504
Electrolytic and high grade 99·95 per cent	5,227
Prime Western, G.O.B. and debased	10,186
Remelted	331
Scrap Brass and other Cu alloys	3,126
Scrap Zinc, alloys and residues	3,034

ANTIMONY	
Batteries	115
Other Antimonial Lead	58
Bearings	35
Oxides—for White Pigments	123
Oxides—other	80
Miscellaneous Uses	14
Sulphides	5
Total Consumption	430
Antimony in Scrap	
For Antimonial Lead	400
For Other Uses	15
Total Consumption	415

LEAD	
Cables	9,854
Batteries	2,602
Battery Oxides	2,637
Tetra Ethyl Lead	1,754
Other Oxides and Compounds	2,685
White Lead	752
Shot	323
Sheet and Pipe	5,571
Foil and Collapsible Tubes	417
Other Rolled and Extruded	531
Solder	1,146
Alloys	1,686
Miscellaneous Uses	1,102
Total	31,060

CADMIUM	
Plating Anodes	47·40
Plating Salts	6·90
Alloys: Cadmium Copper	4·70
Alloys: Other	2·85
Batteries: Alkaline	8·00
Batteries: Dry	0·30
Solder	4·85
Colours	13·70
Miscellaneous Uses	2·35
Total Consumption	91·05

TIN	
Tinplate	699
Tinning:	
Copper Wire	47
Steel Wire	7
All other	63
Solder	133
Alloys	509
Foil and Collapsible Tubes, etc.	58
Tin Compounds and Salts	92
Miscellaneous Uses	7
Total Consumption	1,615

Richard Thomas and Baldwins

Group manufacturing and trading profit for 52 weeks ended September 28, 1957, £9,694,407 (£10,075,840). Add income from investments and interest receivable less payable, and deduct depreciation £2,294,906 (£2,008,490) and tax £3,417,452 (£4,056,397), leaving £4,264,563 (£4,313,848). Balance available to parent company after including £1,400,000 (£265,000) prior tax provisions unrequired was £5,503,440 (£4,428,068). Dividends paid and recommended 13½ per cent less tax required £840,576 (same) £1,500,000 (£1,200,000) has been transferred to fixed assets replacement reserve. A further £2,500,000 (£1,866,439) transferred to general revenue reserve and £229,823 (£305,000), representing reduction in tax liability attributable to investment allowances, transferred to investment allowances reserve. Surplus forward £7,921,505 (£7,488,464).

An Acquisition

It is reported that Reynolds T.I. Aluminium has acquired the Ordinary shares formerly held by Ekco Products and the Prestige Group as a trade investment in Venesta.

Swedish Aluminium

AB Svenska Metallverken have decided to transfer their aluminium foil production from Finspaang to Skultuna, in Vaestmanland, it is announced.

Scrap Metal Prices

Merchants' average buying prices delivered, per ton, 21/1/58.

	£
Aluminium	
New Cuttings	160
Old Rolled	130
Segregated Turnings	97
Brass	
Cuttings	118
Rod Ends	108
Heavy Yellow	90
Light	85
Rolled	108
Collected Scrap	87
Turnings	103
Copper	
Wire	146
Firebox, cut up	146
Heavy	139
Light	134
Cuttings	146
Turnings	130
Braziery	118
Gunmetal	
Gear Wheels	150
Admiralty	150
Commercial	123
Turnings	118
Lead	
Scrap	63
Nickel	
Cuttings	—
Anodes	540
Phosphor Bronze	
Scrap	123
Turnings	118
Zinc	
Remelted	52
Cuttings	44
Old Zinc	29

The latest available scrap prices quoted on foreign markets are as follow. (The figures in brackets give the English equivalents in £1 per ton.) :—

West Germany (D-marks per 100 kilos):		
Used copper wire	(£156.12.6)	180
Heavy copper	(£152.5.0)	175
Light copper	(£130.10.0)	150
Heavy brass	(£95.15.0)	110
Light brass	(£71.7.6)	82
Soft lead scrap	(£56.10.0)	65
Zinc scrap	(£39.2.6)	45
Used aluminium unsorted	(£82.12.6)	95
France (francs per kilo):		
Copper	(£204.10.0)	235
Heavy copper	(£204.10.0)	235
Light brass	(£148.0.0)	170
Zinc castings	(£68.15.0)	79
Tin	(£565.10.0)	650
Aluminium pans (98½ per cent)	(£139.5.0)	160

Italy (lire per kilo):		
Aluminium soft sheet clippings (new)	(£194.7.6)	335
Aluminium copper alloy	(£104.10.0)	180
Lead, soft, first quality	(£88.15.0)	153
Lead, battery plates	(£53.7.6)	92
Copper, first grade	(£165.7.6)	285
Copper, second grade	(£150.17.6)	260
Bronze, first quality machinery	(£171.2.6)	295
Bronze, commercial gunmetal	(£142.2.6)	245
Brass, heavy	(£113.2.6)	195
Brass, light	(£104.10.0)	180
Brass, bar turnings	(£119.0.0)	205
New zinc sheet clippings	(£58.0.0)	100
Old zinc	(£43.10.0)	75

THE STOCK EXCHANGE

With Only A Moderate Amount Of Buying Industrials Show A Slightly Upward Tendency

ISSUED CAPITAL •	AMOUNT OF SHARE	NAME OF COMPANY	MIDDLE PRICE 21 JANUARY	+RISE —FALL	DIV. FOR LAST FIN. YEAR	DIV. FOR PREV. YEAR	DIV. YIELD	1957 HIGH	1957 LOW	1956 HIGH	1956 LOW
£	£				Per cent	Per cent					
4,435,792	1	Amalgamated Metal Corporation ...	19/6		10	10	10 5 3	28/3	18/–	25/–	20/–
400,000	2/–	Anti-Attrition Metal	1/6	+3d.	8½	7½	11 6 9	2/6	1/6	2/2½	1/6½
33,639,483	Stk. (£1)	Associated Electrical Industries ...	48/–	—6d.	15	15	6 5 0	72/3	47/9	85/7½	57/3
1,590,000	1	Birfield Industries	51/9	+6d.	15	20N	5 16 0	70/–	48/9	110/7½	48/9
3,196,667	1	Birmid Industries	57/3	+3d.	17½	17½	6 2 3	80/6	55/9	81/9	58/9
5,630,344	Stk. (£1)	Birmingham Small Arms	26/–	—1½d.	10	8	7 13 9	33/–	21/9	39/9	20/–
203,150	Stk. (£1)	Ditto Cum. A. Pref. 5%	15/–		5	5	6 13 3	16/–	15/–	18/6	14/10½
350,580	Stk. (£1)	Ditto Cum. B. Pref. 6% ...	16/6		6	6	7 5 6	19/–	16/6	21/6	17/9
500,000	1	Bolton (Thos.) & Sons	28/9		12½	12½	8 14 0	30/3	28/9	31/–	29/6
300,000	1	Ditto Pref. 5%	15/3		5	5	6 11 3	16/9	14/3	18/1½	15/9
160,000	1	Booth (James) & Co. Cum. Pref. 7%	19/–		7	7	7 7 3	22/3	18/9	23/–	21/6
9,000,000	Stk. (£1)	British Aluminium Co.	43/3	+1/3	12	12	5 11 0	72/–	38/3	81/10½	40/6
1,500,000	Stk. (£1)	Ditto Pref. 6%	18/6		6	6	6 9 9	21/6	18/–	21/10½	19/6
15,000,000	Stk. (£1)	British Insulated Callender's Cables	40/–	+9d.	12½	12½	6 5 0	55/–	40/–	54/9	45/3
17,047,166	Stk. (£1)	British Oxygen Co. Ltd., Ord. ...	30/–	+4½d.	10	15N	6 13 3	39/–	29/6	63/6	32/3
600,000	Stk. (5/–)	Canning (W.) & Co.	20/9	+6d.	25	25	6 0 6	24/6	19/3	25/6	19/–
60,484	1/–	Carr (Chas.)	2/3		25	25	11 2 3	3/6	2/1½	3/–	2/4½
150,000	2/–	Case (Alfred) & Co. Ltd.	4/7½		25	25	10 16 9	4/6	4/–	5/–	3/10½
555,000	1	Clifford (Chas.) Ltd.	15/9		10	15N	12 14 0	20/6	15/9	35/–	21/1½
45,000	1	Ditto Cum. Pref. 6%	15/10½		6	6	7 11 3	17/6	16/–	19/–	17/9
250,000	2/–	Coley Metals	4/6		25	25	11 2 3	5/7½	3/9	5/1½	3/7½
8,730,596	1	Cons. Zinc Corp.†	51/–	+1/9	22½	22½	8 16 6	92/6	49/–	70/7½	46/3
1,136,233	1	Davy & United	48/–	+1/–	15	12½	6 5 0	60/6	42/6	50/6	41/3
2,750,000	5/–	Delta Metal	20/6	—4½d.	*17½	*17½	4 5 6	28/6	19/–	25/9	18/3
4,160,000	Stk. (£1)	Enfield Rolling Mills Ltd.	24/–	—6d.	15B	22½	10 8 0	38/6	25/–	39/7½	30/–
500,000	1	Evered & Co.	41/–		15	15	7 6 3	52/9	42/–	56/–	52/–
18,000,000	Stk. (£1)	General Electric Co.	37/9	+6d.	14	12½	7 8 0	59/–	38/–	65/6	41/3
1,250,000	Stk. (10/–)	General Refractories Ltd.	27/9		17½	17½	6 6 0	37/–	26/9	33/6	24/1½
401,240	1	Gibbons (Dudley) Ltd.	64/6		15	12	4 13 0	71/–	53/–	54/–	50/–
750,000	5/–	Glacier Metal Co. Ltd.	5/9		11½	11½	10 0 0	8/1½	5/10½	8/6	6/3
1,750,000	5/–	Glynwed Tubes	12/9	—3d.	20	20	7 16 9	18/–	12/6	18/3	15/9
3,614,032	10/–	Goodlass Wall & Lead Industries ...	29/3		18	16	6 3 0	37/3	28/9	34/7½	26/10½
342,195	1	Greenwood & Batley	46/10½xd	+7½d.	17½	17½	7 9 3	50/–	46/–	48/–	45/–
396,000	5/–	Harrison (B'ham) Ord.	11/6	—9d.	*15	*30‡	6 10 6	16/9	12/4½	42/9	14/10½
150,000	1	Ditto Cum. Pref. 7%	18/9		7	7	7 9 3	22/3	18/7½	25/–	22/–
1,075,167	5/–	Heenan Group	7/–		10	20‡	7 2 9	10/4½	6/9	‖8/6	6/6‡
142,045,750	Stk. (£1)	Imperial Chemical Industries ...	38/7½	+7½d.	10	10	5 3 9	46/6	36/3	50/–	36/6
33,708,769	Stk. (£1)	Ditto Cum. Pref. 5%	17/–	+3d.	5	5	5 18 0	18/6	15/6	19/9	16/3
14,584,025	**	International Nickel	138		$3.75	$3.75	4 17 0	222	130	210	141½
430,000	5/–	Jenks (E. P.) Ltd.	15/3	+4½d.	27½‡	27½	9 0 6	18/10½	15/1½	18/3	15/–
300,000	1	Johnson, Matthey & Co. Cum. Pref. 5%	15/–		5	5	6 13 3	17/–	14/6	18/–	16/3
3,987,435	1	Ditto Ord.	40/–xd	+4½d.	10	9	5 0 0	58/9	40/–	52/–	40/9
600,000	10/–	Keith, Blackman	16/3	+3d.	15	15	9 4 6	21/9	15/–	25/10½	18/9
160,000	4/–	London Aluminium	4/1½		10	5	9 14 0	6/9	3/6	8/–	5/–
2,400,000	1	London Elec. Wire & Smith's Ord....	40/9	—3d.	12½	12½	6 2 9	54/6	41/–	52/9	42/6
400,000	1	Ditto Pref.	22/9	+1/6	7½	7½	6 11 9	25/3	21/9	26/–	24/–
765,012	1	McKechnie Brothers Ord.	37/6		15	15	8 0 0	48/9	37/6	58/1½	50/6
1,530,024	1	Ditto A Ord.	36/3		15	15	8 5 6	47/6	36/–	58/–	46/9
1,108,268	5/–	Manganese Bronze & Brass	9/1½	—4½d.	27½‡	25	7 10 9	21/10½	7/6	18/9	15/4½
50,628	6/–	Ditto (7½% N.C. Pref.)	5/9		7½	7½	7 16 6	6/6	5/–	6/3	5/6
13,098,855	Stk. (£1)	Metal Box	42/1½	—4½d.	20‡	15M	4 15 0	59/–	40/3	54/6	41/6
415,760	Stk. (2/–)	Metal Traders	6/4½		50	50	15 13 9	8/–	6/3	8/–	5/10½
160,000	1	Mint (The) Birmingham	22/9		10	10	8 15 9	25/–	21/6	25/3	22/6
80,000	5	Ditto Pref. 6%	83/6		6	6	7 3 9	90/6	83/6	92/6	84/6
3,064,930	Stk. (£1)	Morgan Crucible A	35/9xd	—1½d.	10	11	5 12 0	54/–	35/–	48/3	38/6
1,000,000	Stk. (£1)	Ditto 5½% Cum. 1st Pref. ...	17/3	+3d.	5½	5½	6 7 6	19/3	16/–	20/7½	18/–
2,200,000	Stk. (£1)	Murex	55/6	—3d.	20	20	7 4 3	79/9	57/–	74/–	60/–
468,000	5/–	Ratcliffe (Great Bridge)	6/10½		10	10Y	7 5 6	8/–	6/10½	10/3	7/–
234,960	10/–	Sanderson Bros. & Newbould ...	25/6		27½D	27½	7 3 9	41/–	24/9	38/–	33/–
1,365,000	Stk. (5/–)	Serck Radiators	11/3	—1½d.	17½Z	15	5 3 9	18/10½	11/6	16/3	12/3
600,400	Stk. (£1)	Stone (J.) & Co. (Holdings)	44/–		16	16	7 5 6	57/6	43/9	59/6	49/–
600,000	1	Ditto Cum. Pref. 6½%	19/10½		6½	6½	6 10 9	21/9	18/9	21/9	20/3
14,494,862	Stk. (£1)	Tube Investments Ord.	51/10½	—4½d.	15	15	5 15 9	70/9	50/6	70/7½	50/9
41,000,000	Stk. (£1)	Vickers	30/3	+9d.	10	10	6 12 3	46/–	29/–	44/6	32/4½
750,000	Stk. (£1)	Ditto Pref. 5%	15/6		5	5	6 9 0	18/–	14/–	18/7½	15/3
6,863,807	Stk. (£1)	Ditto Pref. 5% tax free	22/–		*5	*5	7 0 3A	24/9	20/7½	25/6	22/6
2,200,000	1	Ward (Thos. W.), Ord.	72/9	+1/–	20	15	5 10 0	83/–	64/–	69/3	58/9
2,666,034	Stk. (£1)	Westinghouse Brake	33/4½xd	+6d.	10	18P	6 0 0	85/–	29/1½	100/6	68/–
225,000	2/–	Wolverhampton Die-Casting ...	7/6	+3d.	25	40	6 13 3	10/1½	7/–	14/10½	8/–
591,000	5/–	Wolverhampton Metal	15/1½	+1½d.	27½	27½	9 1 9	22/3	14/9	21/10½	16/–
78,465	2/6	Wright, Bindley & Gell	3/6xd		20	17½E	14 5 9	3/9	2/7½	3/9	2/6
124,140	1	Ditto Cum. Pref. 6%	11/6		6	6	10 8 9	12/6	11/3	14/–	12/4½
150,000	1/–	Zinc Alloy Rust Proof	2/10½	+1½d.	40D	33½	9 5 6	5/–	2/9	4/–	2/9

*Dividend paid free of Income Tax. † Incorporating Zinc Corpn. & Imperial Smelting. ** Shares of no Par Value. ‡ and 100% Capitalized issue. • The figures given relate to the issue quoted in the third column. A Calculated on £7 14 6 gross. H and 200% capitalized issue. M and 10% capitalized issue. Y and 25% capitalized issue. ‖ Adjusted to allow for capitalization issue E for 15 months. P and 100% capitalized issue, also "rights" issue of 2 new shares at 35/– per share or £3 stock held. D and 50% capitalized issue. Z and 50% capitalized issue. B Equivalent to 12½% on existing Ordinary Capital after 100% capitalized issue.